Adaptive Efficiency in Coffee Clusters: Resilience Through Agglomeration, Global Value Chains, Social Networks, and Institutions

A Dissertation
Presented to
The Academic Faculty

by

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In Partial Fulfillment
of the Requirements for the Degree
PhD in City and Regional Planning in the
School of City and Regional Planning

Georgia Institute of Technology
[May, 2017]

ADAPTIVE EFFICIENCY IN COFFEE CLUSTERS: RESILIENCE THROUGH AGGLOMERATION, GLOBAL VALUE CHAINS, SOCIAL NETWORKS, AND INSTITUTIONS

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To coffee farmers in Costa Rica and Mexico.

To my mother.

To Rebeca.

ACKNOWLEDGEMENTS

I owe an enormous debt of gratitude to my wife, Rebeca, who has been a patient observer, collaborator, and supporter to this process on every level. My parents have also been extremely supportive, especially my mother. Also, thank you to my sister Kate for your last-minute editing help!

At Georgia Tech, my advisor, Dr. Michael Elliott has been a patient and supportive presence in this process. Thank you for allowing me to seek out a project that in many ways is unusual for the department. Also, thank you to Dr. Bruce Stiftel for the department's support of my time in the program, and to Dr. Subhro Guhathakurta and Dr. Nancey Green Leigh for being good mentors during my time helping with Journal of Planning Education and Research. Thank you to Dr. Jennifer Clark for your insights on my drafts, and to Dr. Raffaele Vignola (CATIE) for willing to be patient with all the difficulties of remote video and presentations. Also, to Dean Steven French, thank you for allowing me the opportunity to work on the CHAMP project.

I would like to thank Dr. Juan Crespo for providing comments on one version of my questionnaire, and Dr. Elisa Baldassari, and Dr. Andrea Morrison for sharing versions of social network questionnaires used.

In Costa Rica, I enjoyed important and extended conversations with Dr. Rafael Diaz-Porras, Dr. Wilson Picado, and Dr. Nicole Siblet. Dr. Siblet was generous with her time and accompanied me in the field for one week. Representatives of ICAFE, MAG, and INEC, were also very generous with their time, and helping me obtain data.

In Mexico, would like to thank Dr. Bruce Fergusson and El Colegio de la Frontera Sur (ECOSUR) for hosting me as a visiting researcher in 2014. Also, thank you to COMEXUS and Fulbright, for allowing me to participate in the Fulbright Garcia-Robles program. May the bonds that tie our two nations only become stronger. Representatives of INEGI, SAGARPA, and AMECAFE, as well as other government entities, were also very generous with their time, and with providing invaluable data. I had several very informative conversations with Dr. Estaban Escamilla, Dr. Maria Elena Martinez, Dr. Ana Amelia Gonzalez, and Prof. Guillermo Montero, which undoubtedly informed my work.

So many people in the coffee industry took time to talk with me, and I am truly grateful for their generosity, and patience. I hope this research starts to repay their time and openness.

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LIST OF SYMBOLS AND ABBREVIATIONS

AMECAFE	Asociación Mexicana de la Cadena Productiva del Café (Mexican Coffee Supply Chain Association)
ASERCA	Agencia de Servicios a la Comercialización y Desarrollo de Mercados (SAGARPA's Agricultural Risk Managment Branch)
CA	Comunidad Agraria (Agrarian Community) Communal Indigenous Land
CDI	National Indigenous Comisión, Mexico
CNC	Confederación National Campesina (CNC) (National Pesante Confederation for Ejidos -PRI Aligned Organization)
CICAFE	Center for Coffee Research (ICAFE) CR
CNOC	MX National Federation of Coffee Organization
Ejido	Communal land system in MX set up under PRI land reform in S. XX
FIRA	Bank of Mexico's Agricultural Lending Trust
FLO	Fairtrade Labelling Organizations International
RA	Rainforest Alliance
IADB	Inter-American Development Bank
ICA	International Coffee Agreement
ICAFE	Costa Rican Coffee Institute
ICO	International Coffee Organization
INMECAFE	Mexican Coffee Institute (Defunct)
INEC	Costa Rica Census Institute
INEGI	Mexico Census Institute

PRI	Inst. Revolutionary Party (government post-Mexican revolution until 2000)
SAGARPA	Mexican Agricultural Secretariat
SEDESOL	Mexico Social Development Secretariat
SIAP	National Service for Agricultural Data Mexico
Social Sector	Industry term in Mexico from 1990s reforms referring to small holder growers
Coyote	Commercial agent, or intermediary, for private firm that purchases coffee
CATIE	Tropical Research Institute, Turrialba CR
UNA	Universidad Nacional de Costa Rica
USAID	US Agency for International Development
WTO	World Trade Organization
Parchment Coffee	Dried coffee with husk still on (stage between wet and dry mill)
Cherry Coffee	Unprocessed bean and fruit
Green Coffee	Processed Coffee, dried, ready for roasting
MAG	Ministry of Agriculture
Dry Mill	Facility for Processing, Sorting, and Preparing Parchment Coffee for Export
Wet Mill	Facility for Processing and Drying Cherry Coffee
1 C-Contract	37,500 pounds of coffee (250 bags of coffee, each weighing 152 pounds)
1 Quintal	100 pounds green coffee (250kg cherry coffee = 550 pounds)
1 Fanega	aApproximately 100 pounds of green coffee (similar to quintal)

SUMMARY

This dissertation builds and tests a model of economic resilience in developing country agricultural clusters. I seek to explain resilience trough a model based around institutional, relational, and spatial factors, which I call adaptive efficiency, borrowing from institutional economics and economic geography. From the standpoint of a coffee cluster, resilience is the capacity to withstand market-based and environmental shocks, and upgrade overtime to remain competitive in the Global Value Chain in terms of providing a sustainable livelihood for farmers in the cluster. Local coffee economies, or clusters, are adaptively efficient within Global Value Chains (GVCs) when they can capitalize on spatial agglomeration economies, and are organized around institutional structures and organizations that promote strong and open networks. This adaptive efficiency model for agricultural clusters is measured and tested using a mixed methods approach that incorporates statistical models, social network analysis (SNA), and comparative case studies to assess the model's efficacy in predicting coffee cluster resilience. Coffee cluster resilience is measured through changes in local coffee land use patterns and production volumes, as well as qualitative data, focused on product and production upgrading, adaptations in governance, and support of farmers. In terms of planning and development practice, this research will help build strategy to design more effective institutions, policies, and interventions at the cluster level with greater knowledge of the factors leading to resilient local industries

CHAPTER 1. INTRODUCTION

1.1 Overview

This dissertation builds and tests a model of economic and environmental resilience in developing country agricultural clusters. Borrowing from economic geography, institutional economics, global change, and environmental management theories, this study seeks to explain resilience through *adaptive efficiency*. The term means the ability to "adjust flexibly in the face of shock and evolve institutions that effectively deal with altered reality," (North 2003, 12), which has most often been used in large scale (national) economic analyses. I combine this concept, with Schmitz's (1995) concept of *collective efficiency* to develop a more comprehensive model for predicting local industry resilience of agricultural clusters in developing countries.

The dissertation examines adaptive efficiency and its impact on resilience in the specific context of coffee production in Costa Rica and Mexico. Local coffee economies (sub-clusters) are adaptively efficient within Global Value Chains (GVCs) when they are able to capitalize on spatial agglomeration economies, and are organized around institutional structures and organizations that promote strong and open networks. Networks of relationships within coffee clusters promote *adaptive efficiency* through market interactions and collaborative relationships, as manifested through agglomeration factors, relational factors, and institutional factors (I explain the elements of this model in detail in Chapter III Conceptual Model, after explaining its underpinnings in Chapter II Literature Review).

This *adaptive efficiency* model is measured and tested using a mixed-methods approach that incorporates statistical models, social network analysis (SNA), and comparative case studies to assess the model's efficacy in predicting coffee cluster resilience. From the standpoint of a coffee cluster, resilience is the capacity to withstand market-based and environmental shocks, and upgrade over time to remain competitive in the Global Value Chain and in terms of environmental practices.

Coffee cluster resilience is measured through changes in local coffee land use patterns and production volumes, as well as qualitative data, focused on product and production upgrading, governance reorientation, and support for farmers. The findings from this study will contribute to a better understanding of the fundamental drivers of resilience in local agricultural clusters. In terms of planning and development practice, this research will help to build methods that allow policy makers to promote more effective institutions and develop policies at the cluster level with greater knowledge of the factors leading to resilient local industries.

1.2 Problem Statement

In recent decades, sustainable rural development has faced obstacles in both the economic North and South due to globalization-driven restructuring that has undermined the viability of traditional rural economic models (Hall 2005). Market-oriented agricultural and trade policies have removed protection and support mechanisms from rural communities, especially in developing countries (Dicken 2011). Furthermore, in nations with emerging economies, societies that until recently depended on agriculture as an economic engine have rapidly moved into a service oriented urban paradigm, which further threatens rural communities and their working landscapes (Kilian 2006). And while they have long been part of literature on the developing world, in US planning literature local production systems have captured increasing attention; planners now recognize that sustainable and diversified rural and peri-urban development depend on preserving local agricultural systems (Hall 2005, Brinkley 2012, Campbell 2013). Thus, there is a broad interest in understanding how planning and policy can support agricultural clusters, and more generally, what can be done to promote the resilience of local industries in an era of environmental uncertainties and global networks of trade and capital.

This project builds on previous work on cooperatives in agriculture and agricultural sustainability issues (Di Falco et al. 2005, Lewis & Mosses forthcoming, Ronchi 2002, Lyon 2007, Kimball 1988, Milford 2011, Valentinov 2007, Valantinov 2013, Wollni & Fisher 2012, Wollni et al. 2010, Sykuta and Cook 2001). To demonstrate resilience, local agricultural economies must plan for change and cope with new circumstances presented by climate change, environmental conditions, production practices, and globalized market forces. This all occurs in a context, where transnational firms and commodities exchanges hold power (Dicken 2011). Local agricultural production networks are often "captive" to networks of "much larger buyers." (Gereffi et al 2005, 84). Thus, planning for resilience in local agricultural economies requires understanding that they are embedded in both Global Value Chains (Dicken 2011, Clark 2013) and multi-tiered socio-ecological systems (Adger 2000, Folke 2005, Lambin & Meyfroidt (2010)).

Agricultural industries that sell commodities have uniquely complex vulnerabilities, and developing cluster level policies for these industries is difficult because of their vulnerability to both global environmental and market systems. Because of these vulnerabilities, a resilience framework that recognizes the importance of social capital and relationships within a system of long-term endogenous and exogenous stressors and shocks is a useful starting place for conceptualizing the problem, and can complement some of the reductionism of a singular focus on competitiveness.

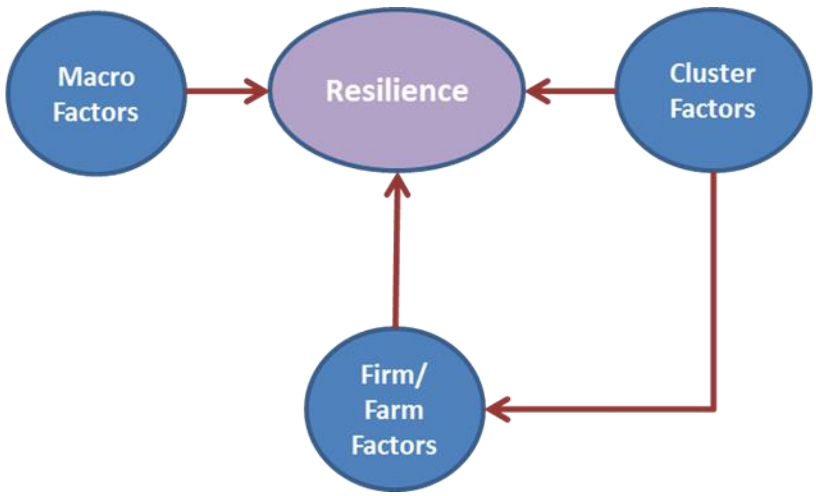

Figure 1-1 Key Resilience Factors

I present resilience in agricultural industries as the interplay of elements in three overarching categories ():

1) **Macro factors**, which are independent of local industrial organization and structure, such as environmental endowments, urbanization, market forces and national policies.
2) **Cluster factors**, which comprise the structure and function of regional production and collaboration networks.
3) **Firm factors**, which are the financial, natural, social, and human capital endowments of local organizations and farmers.

Regional resilience literature has begun to address many of these factors, but uncertainty remains about what planning and policy for resilience at the cluster level should prioritize for agricultural industries, given that the local is imbedded in larger systems of exchange.

This research focuses primarily on the cluster factors. A cluster is a geographically linked group of firms and supporting institutions in a particular industry or group of inter-related industries. Clusters are a useful conceptual framing for exploring local and industry-specific governance regimes and organizational structures in the coffee industry that best support resilient local agricultural economies. This is a new approach for planners with respect to rural development and agriculture, and represents an alternative to or enhancement of agricultural land use protection strategies. It provides an additional research agenda based on the effect of the organization and governance systems of local industry clusters upon their resilience, or ability to promote long term sustainable development.

1.2.1 The problem in Central American and Mexican Coffee

Not only is coffee the world's second leading commodity in terms of trade value, but it also buttresses the livelihood of millions of small farmers in impoverished tropical regions. Resilience in coffee is important beyond the industry itself because coffee farming creates landscapes that frame the cultural heritage of many rural communities (Eakin et al. 2009, Parra-Zapata 2011, Guhl 2004). Coffee agriculture also provides important ecosystem services (Perfecto et al. 1996, Philpott et al. 2003, Philpott et al. 2008, Rice et al. 1995, Perfecto and Vandermeer 2008a, Jah et al 2011) and is important for strategies that address the drivers of climate change. Coffee agriculture's environmental benefits come mainly from the crop's ability to grow under a canopy of trees, which creates a suitable habitat to preserve biodiversity, prevent erosion, protect watersheds, and absorb carbon (Perfecto and Vandermeer 2008a, Verbist et al 2010, Babbar and Zac 1995, ICAFE 2011). Therefore, beyond the theoretical contributions of this dissertation, understanding coffee resilience is an important topic for planning due to this industry's role in providing cultural, environmental, and economic benefits within rural regions.

1.2.2 Threats to Resilience in the Global Value Chain

As a basis for understanding coffee resilience, we must first outline the factors that pose threats and risks to its survival. Researchers from Costa Rica have describe these risks as crop disease risk, climate risk, and price risk (Valenciano-Salazar 2010), which are exacerbated by barriers to credit and uncoordinated state policies toward the sector (Diaz-Porras 2003, Carranza et al 2012). The World Bank describes risk in the coffee supply chain as production risks (e.g., crop failure), market risks (e.g., swift price changes), and enabling environment risks (e.g., changes in market regulation) (Parizat et al 2015, 6).

1.2.2.1 Economic Pressures

Ceteris paribus, coffee industries in nations with lower production costs have grown steadily, while older, less competitive areas have suffered. Many traditional coffee-exporting countries, like Costa Rica and Mexico, now produce considerably less coffee than they did in the 1990s, and low cost producers, such as Vietnam and Brazil, produce more. This trend in many ways confirms the neoclassical idea of competitiveness and factor-price driven regional development, or even neo-structuralist ideas about regional change and the tendency of the rate of profit to fall once diffusion occurs under the profit cycle theory (Dawkins 2003, Markusen 1986). However, these theories do not tell the whole story, and overlook the effect of agency within local regions.

Globalization has impacted local agricultural systems and forced them to reconstruct new relationships with markets and consumers in order to survive (Hall 2005). Coffee in Central America and Mexico is a paradigmatic example of this shift (Ponte 2002, Bacon 2005, Muridian & Pelupussy 2005). Before the 1990s, producers enjoyed relative stability under a managed trade regime. This stability crumbled during the Washington Consensus years, when liberalized markets opened up new production frontiers as countries that had been behind the Iron Curtain developed national coffee export industries (e.g., Vietnam), leading to dramatic price drops that threatened long established producer communities, especially in Central America and Mexico. Prices declined precipitously from the mid-1990s until 2003 in a period known as the "coffee crisis." (Bacon 2005). The traditional producers of Arabica coffee in Central America were small-hold farmers, who always operated on low margins within traditional production systems, and in difficult geography, but with a high quality product (Varangis et al 2003). They struggled to compete in the globalized market, as large portions of the workforce migrated to the United States while growing industrial sector cities and input prices rose (Bacon et al 2005).

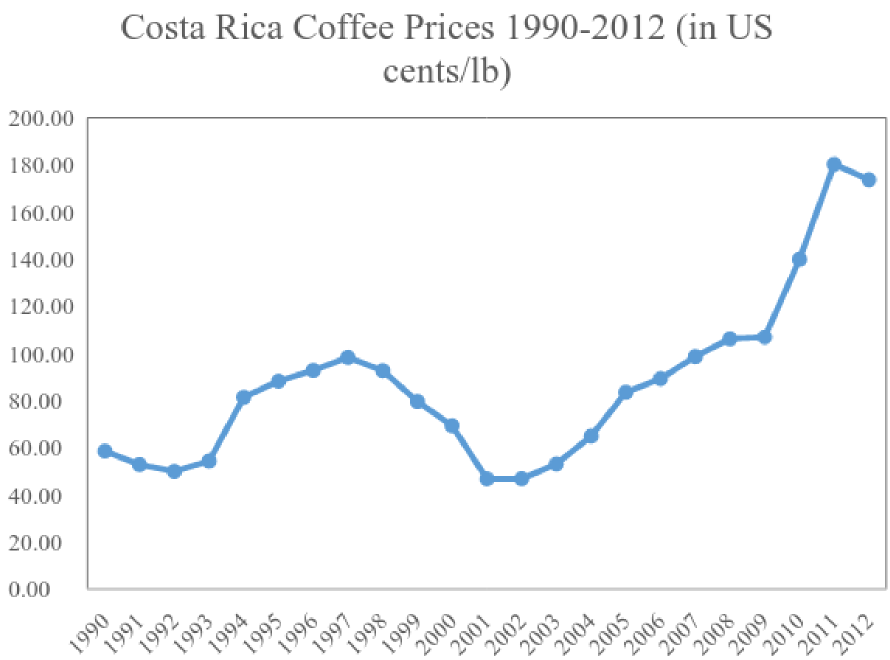

Figure 1-2 CR Coffee Prices to Farmers-Crisis from 1999-2005, and Recovery in 2005, IOC 2015

In part due to the emergence of specialty coffee markets in wealthy coffee-consuming countries, prices rebounded in the late 2000s, but the demands of new markets led to restructuring that permanently altered geographies and cultures of production (Rueda and Lambin 2012). Local producers must now negotiate new paths within global economic networks, which means access to networks of resources and knowledge is more important than ever.

In this narrative, lower yields and the decline of lowland coffee in Central American countries over the last 20 years were inevitable because of markets' tendency to abandon lower profit locations. While accepting that this is a strong explanation of large-scale trends, I argue that the geography of coffee production, and of industries in general is more complicated than this perspective: it is embedded in social, cultural, and institutional production systems. These elements contribute to industrial stickiness, and the ability to adapt and perpetuate profits over time, extending the profit cycle locally, or inventing new cycles within an industry.

This dissertation will show that local coffee production regions in Costa Rica and Mexico have varied in their response to global market forces. Thus, I engage with the concept of *resilience* to address the capacity of a local cluster to adapt. This project focusses upon evaluating the effect of key firms (Markusen 1994) and their institutional orientation, as well as the governance structure, upon social networks and resilience, thereby disentangling the local role, and studying how different regional responses contribute to the construction of value chain relationships. To assess the model of the *adaptive efficiency* in driving resilience at the regional level, I measured and analyzed how selected regions in Costa Rica and Mexico adapted to global economic pressures during periods of crash and recovery from 2002 to 2012 (Figure 1.2).

1.2.2.2 Environmental Shocks

Explaining the role of cluster-based industry organization and governance and why some regions could recover resiliently from the historical price shock, while others have lagged, is the principal focus of this project, but agricultural resilience cannot be framed only in market terms. Coffee is a socio-ecological system, where economic and environmental aspects of production interact.

For example, coffee clusters must cope with increasing crop losses due to catastrophic weather and disease events, which are magnified by years of unsustainable agricultural practices and will be magnified in the future by global warming (Eakin et al

2006, Eakin et al 2012, Tucker 2010). Since the beginning of this project, coffee leaf rust (*La Roya*) and drought have devastated Central American production, destroying 40% of the crop (Guilford 2014). However, the coffee fungus epidemic's impact has not been uniform. *La roya* has tended to hit harder in areas with less capacity for environmental governance and industry coordination. This may be a predictor for future vulnerability to similar systemic shocks related to climate change. I address the comparative reaction of different clusters to coffee leaf rust as one of the tests of resilience in this project.

1.3 Dissertation Outline

In summary, this dissertation will evaluate resilience in local coffee clusters by examining three critical factors for *adaptive efficiency*: (1) local agglomeration economies, (2) social capital and relational networks, and (3) the institutional orientation of clusters (specifically the governance structures of local mills). I will do so by first presenting a relevant literature review and explanation of my adaptive efficiency model in Chapters 2 and 3, before explaining my mixed methods approach and case selection criteria in Chapters 4 and 5. In Chapter 6, I examine case-level outcomes from selected indicators of resilience, In Chapter 7, I present the results from my social network surveys and analysis. In Chapter 8, I present the results of my qualitative case studies based on interviews with representatives of mills and other key informants. In Chapter 9, I present the results of a regression model testing the resilience of coffee land use in Costa Rica. Finally, in Chapter 10, I offer a convergent analysis of my overall research, and in Chapter 11 I offer final conclusions about the adaptive efficiency model, and take always for planners.

CHAPTER 2. LITERATURE REVIEW

2.1 Resilience and Coffee

Regional economies face increasing global environmental and economic uncertainty, which within the planning profession has led to growing interest in resilience (Pendall et al 2009, Christopherson et al 2010, Martin and Sunley 2007). Likewise, there is much talk of sustainable coffee, but achieving local industry stability and consolidating new niches require both competitive marketing and production adaptation to sustain yields and avoid environmental degradation. In this sense, *resilience* is a more accurate term than *sustainability*, because production undergoes adaptive cycles, a key concept in resilience literature (Folke 2006, Folke et al. 2005, Duit and Galaz 2008, Wilkerson 2011). Sustainability does not incorporate the idea of adaptive cycles, and as such can suggest a static or linear view of the landscape, which fails to recognize the inevitability of profound changes over time. Furthermore, while the action of purposeful institutions and agents has undoubted impacts on local outcomes, both the institutions and local processes are involved in cycles of evolutionary change beyond the control of local actors.

Resilience as a concept has applications in engineering, ecology, and other scientific fields. In the context of environmental governance and regional development it means "the capacity of a system to absorb disturbance and reorganize while undergoing change to still retain essentially the same function, structure, identity, and feedbacks." (Folke et al. 2005, 443). For present purposes: "Resilience is a measure of the amount of change a system can undergo and still retain the same controls on structure and function or remain in the same domain of attraction." (Lebel et al. 2006, 20).

By "domain of attraction," Lebel et al. refer to a system configuration's desirability from the standpoint of a set of stakeholders, who depend on a certain structural state of functioning or core integrity of internal relationships. This is often expressed with a figure-eight diagram (Holling and Gunderson 2001), which describes a system that goes through a growth phase, to find stability, enters crisis, reorganizes and then either changes fundamentally or re-enters a new cycle of growth and stability (Figure 2-1). This model differs significantly from sustainability in that it recognizes that long-term stability is elusive and that systems must adapt to persist. In coffee, this means maintaining socially and ecologically functional coffee landscapes and avoiding the fracturing of local coffee land use systems such that they are rendered unable to support agglomeration economies and local collaboration networks.[1] In this sense, the retention of coffee land use is postulated to be of similar importance to the survival of the agricultural system as the retention of industrial land is for long-term manufacturing in urban areas (Leigh and Hoelzel 2012).

[1] It may also imply the ability to successfully translate a declining coffee landscape to another pro-social use.

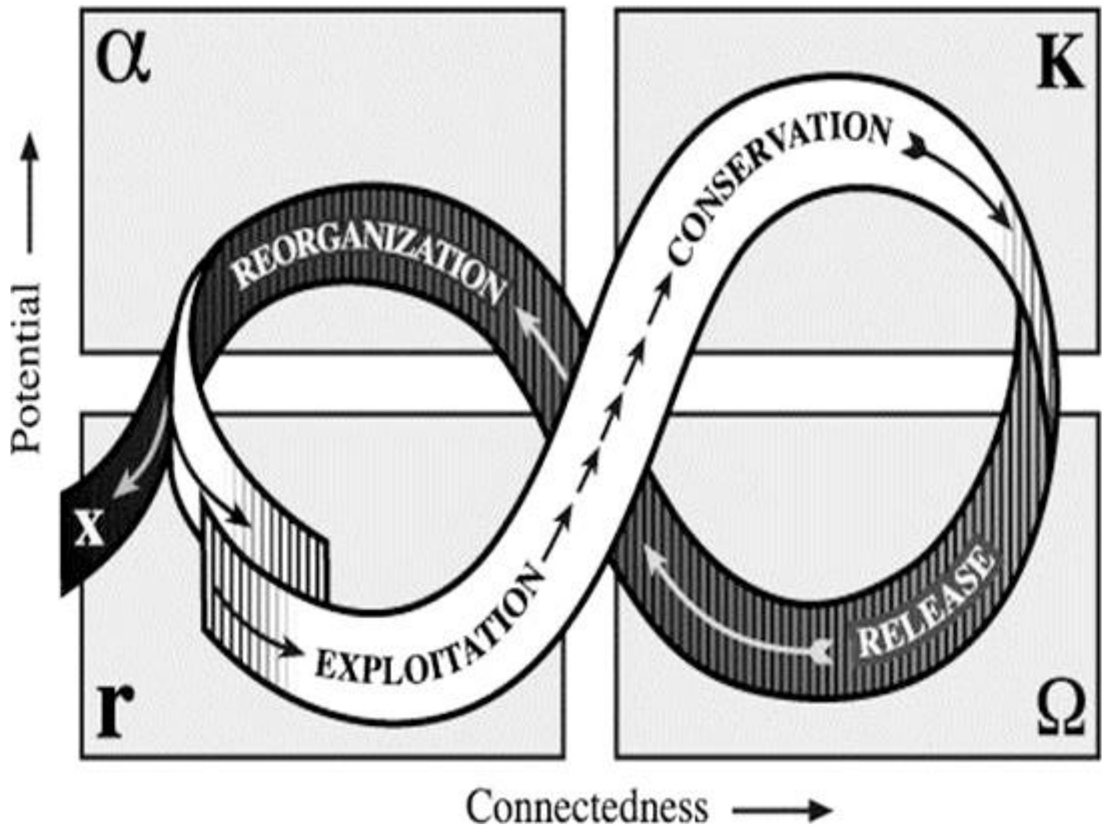

Figure 2-1 Holling and Gudnerson (2001) from Resilience.org/adaptive-cycle

Given its systemic orientation, resilience thinking often coincides with thinking about socio-ecological interactions, where changes in environmental and economic production are mutually interdependent, as is the case of coffee and agroforestry systems. Resilience is often used in socio-environmental models and socio-ecological systems that attempt to apply complex systems models to human-environmental relationships (Folke et al 2006, Adger 2000, Holling and Gunderson 2001). Recently, resilience has often come up in the context of post-disaster recovery (Godschalk 2003, Gunderson 2010, Manuel-Navarrete & Pelling 2011, Gotham & Campanella 2011), increasingly dominating discussions in the era of Climate Change (Pelling 2011).

After the 2008 financial crisis, many academics used resilience concepts to re-frame competitiveness at the regional level in an era of diminished expectations (Pike et al 2010 a & b, Bristow 2010, Hudson 2010, Christopherson et al 2010). Weir et al (2011) published a volume sponsored by the Brookings Institution containing perspectives on resilience in metropolitan areas connected to immigration, foreclosure, and firm innovation, among others. Said volume contains many policy perspectives that attempt to harmonize regional planning and development strategy with resilience thinking, but does so using the term instrumentally. More important for this research is the role of resilience in literature about regional change in evolutionary economic geography (Crespo 2013, Crespo et al 2014, Boschma & Frenken, 2006; Martin & Sunley, 2007, Simmie & Martin 2010).

For regional development, "…resilience depends not only on endowments (producers, networks, skilled labor and strong institutions) but also on capacities (influenced by policy)…" to "leverage innovation" for regional resilience (Clark et al. 2010, 122). Thus, a focus on resilience in regional development shifts the focus from competitiveness and economic growth as monolithic goals to more evolutionary and collaborative thinking (Ibid., Swanstrom 2008, Maru 2007, Clark 2013). What is particular about the economic development related concepts of resilience is that they re-orient the conceptualization of regional performance from one of either absolute competitive advantage or long-term growth, to an idea that regional economies are organized around constantly changing systems in the Schumpeterian tradition. Thus, in the context of generalized shocks and global market changes as experienced by coffee, resilience is not framed in terms of competition, rather a region's capacity to 1) resist shocks, 2) recover from them once they pass, 3) reorient its activities in the altered post-shock world, and 3) renew its growth path or establish a new trend (Martin 2012, 12). This framing attempts to bring the concept of adaptive cycles to regional economic issues (Simmie and Martin 2009), referred to as “adaptive resilience” (Martin 2012). This is not a new endeavor, and borrows heavily from the idea of regional advantage and industrial systems adapting to change developed by Saxenian (1996). I hope to create a model to help explain performance within a framing based on adaptive cycles, and which specifically addresses the issue of global value chains.

Furthermore, while this dissertation focuses on recovery from a shock, coffee farmers face uncertainties about future consumer preferences, global prices, climate change, soil sustainability, and myriad other factors (Eakin et al 2006, Adger et al 2008, Tucker et al 2010). Thus, standardized management and marketing strategies for promoting local coffee production and sale are unrealistic in the long run. Instead capacity to “manage resilience resides in actors, social networks, and institutions,” because resilience in a complex systems framework depends on largely self-organized adaptation and learning (Lebel et al. 2006, 21). Social organization reduces vulnerability in the face of market and environmental shocks (Eakin et al. 2006), and thus, prior resilience research in coffee has often been closely associated with the concept of *vulnerability* (Eakin et al. 2012, Eakin et al. 2006, Maru 2007).

Vulnerability translates into the susceptibility of the industry in a region to suffer systemically either through the loss of key institutions or farmer attrition when confronted with crises, such as diseases or low prices, or slow stressors, such as urbanization. Along with *vulnerability*, some researchers have used *livelihood analysis*, which focuses on the assets and relationships used by the poor to create coping strategies in times of scarcity (IFAD n.d., Morse et al 2009, Morse and McNamara 2013). Interest in what explains regional variations in livelihood strategies among coffee farmers leads researchers to assess how local institutions affect access to resources and the decisions made by small-scale farmers when faced with shocks and stresses caused by events related to climate change and market instability (Tucker et al. 2010, Castellanos et al. 2013). These authors see institutions as central to resilient adaptation, both in terms of improving learning and productivity.

2.2 Sustainability and Resilience

Sustainability and resilience are often confused, but they are distinct concepts. Influential work by key planning scholars in the 1990s and early 2000s laid the foundations for questions of sustainability to be at the core of contemporary planning (Healy and Shaw 1993, Krizek and Power 1996, Campbell 1996, Innes and Booher 2000, Berke 2002) and the concept of sustainability has continued to be a topic of intense planning interest, culminating in the American Planning Association's Sustaining Places Initiative (Godschalk & Rouse 2015)

Sustainability tends to focus on transformative goals, as can be seen in documents such as the Bruntland Report (1987). Much of the literature from planning which considers issues of social equity and reducing the environmental impacts of human settlements falls within this focus on reframing growth and dealing with the tensions involved with encouraging development that balances environmental, social, and economic priorities (Campbell 1996, Saha and Paterson 2005). Sustainable economic development, for example, aims for more than just short-term financial returns, prioritizing growth that does not degrade the environment for future generations and that increases living standards in an equitable manner for all (Leigh and Blakeley 2013).

This kind of transformative change normatively evaluates future outcomes and considers long-term shifts in paradigms (Wheeler 2016). Sustainability transitions require that multiple groups of actors work together to create institutional, policy, or industry-level changes (Morrison 2006, Ross et al 2016). Thinking about sustainability in planning has tended to focus on creating long-term stable systems organized around certain normative goals.

Resilience, in contrast, prioritizes thinking about threats, disturbances, pressures, or the "capacity of a system to respond to change." (Ahern 2011). Thus, resilience is focused on adaptation or more incremental changes in each socio-ecological or economic system.

By focusing on adaptive capacity, resilience is a way of thinking about the complex nature of regional economic, urban, or landscape systems, and how to plan for maintaining their function in the face of long-term stressors and short-term shocks. Resilience theory is less focused on the outcomes, but the processes themselves (Redman 2014). Adaptation is not sustainable per se, but it might lead towards sustainable pathways if adaptation is grounded in long-term environmental and social goals.

In Latin America, sustainability is often described as requiring a process that proceeds from the ground up, building a more just relationship with traditional sources of economic power (Altieri and Masera 1993). In the agricultural industries, sustainability often comes from the creation of values within higher levels of the value chain and is frequently implemented through voluntary programs, such as certifications based around voluntary standards (Giovanucci et al 2005). This imbalance between the desire for local empowerment and the reality of global value chains is a long-term challenge for sustainability policy. To achieve sustainability requires institutional re-configuration (Morrison 2006).

From the perspective of sustainability, the danger is that resilience is directionless, conformist, and apolitical. However, from a different perspective, resilience may be a bridging concept for planning where there is a need to conserve local systems in danger within larger global processes. In this sense, resilience and sustainability are akin to the mixed scanning concept (Etzioni 1967), where longer-term goals are set, but achieved through an iterative incrementalism process.

To achieve shifts in the long-term, systems must get through the shorter and medium terms. Moreover, sustainable outcomes often value sustaining cultural heritages and landscapes, and in the case of agriculture this often involves preserving the industries that built those systems (Gobattoni et al 2015), whether it be for cultural or environmental reasons. Understanding how to make those systems resilient in the context of contemporary economic realities is thus a key pre-requisite for sustainable rural development in many areas. Resilience also recognizes the need for planners to think about adaptation and how systems of governance work together. Understanding resilient governance and planning structures can be a precursor for understanding what is possible in terms of change, given preexisting conditions. A strong focus on pre-existing conditions can help correct some of sustainability's slow uptake as a governing paradigm in practice (Berke 2016), which might be a ramification of its far-sightedness. Focusing on adaptation and conditions that allow for resilient local industries can be a bridge for planners to use to build sustainability into already existing structures and practices.

2.3 Clusters in Agricultural Value Chains

Regional industrial clusters have emerged as a popular framework for promoting economic development, complementing theories about agglomeration economies, the importance of local institutions, and social capital (Lin 2002, Christopherson et al 2010). Somewhat paradoxically, globalization has enhanced the importance of cluster-based governance systems and networks, because regional capabilities are crucial for local industry innovation and the survival of small and medium sized enterprises (Christopherson & Clark 2007, Leigh & Blakely 2013). In part this is because clusters create context to solve issues of governance within global systems, and evolve institutions to foster adaptive practices (Visser and De Langen 2006, Nooteboom 2002, Maskell 2001). De Langen (2004) identifies four variables determining the quality of cluster governance: trust, leader firms, knowledge intermediaries, and solutions to collective action problems.

Cluster-based studies in the wine industry have proved influential in understanding how poorer regions have adapted to perform competitively in global markets (Giuliani 2013, Cassi et al 2012, Perez-Aleman 2005; 2012, and how premier areas have developed successful clusters over decades (Hira and Schwartz 2016). In coffee, many researchers have explored issues of resilience at the farm level, or from the perspective of value chains and agroecology (e.g., Diaz-Porras 2003, Babin 2015). However, little research has linked cluster-based organization to resilience in coffee.

The idea of regional development based around spatial clustering inspired new approaches to local economic development policy in the 1980s and 1990s (Piore and Sable 1984, Porter 1990, Saxenien 1994 & 1995, Storper 1997, Gordon and McCann 2000), and it can similarly influence land use policy at the nexus of rural development and agricultural conservation for ecosystem services.

The most common definition of a cluster is “ a geographically proximate group of interconnected companies and associated institutions in a particular field, linked by commonalities and complementarities. The geographic scope of clusters ranges from a region, a state, or even a single city to span nearby or neighboring countries.”(Porter 2000, 16). Porter wrote a series of famous case studies about the importance of clusters for economic growth, focusing on areas such as Silicon Valley and the California Wine cluster. Around the same time, Krugman used New Economic Geography (NEG) to explain why “footloose” manufacturing often clusters and grows in dense geographically specific areas (Krugman 2011). This method borrows from Markusen’s mapping of core relationships in industrial districts (1994).

In agriculture, the strength of a cluster will depend upon the presence of and interaction among financial institutions, NGOs, government agencies, and environmental regulators relating to agriculture as well as knowledge related institutions, suppliers, and farmers (Garrett et al. 2012 & 2013, Muller et al. 2006). As an example, Porter's representation of the California wine cluster includes “end product or service companies; locally based suppliers (e.g., both local firms and subsidiaries of firms headquartered elsewhere) of specialized inputs, components, machinery, and specialized services;

financial institutions with products tailored to the cluster; and firms in related industries." (Porter et al. 1997).

Porter's cluster schema provides an apt framework for describing coffee clusters in Costa Rica and Mexico. I used Porter's schema to describe the relationships in coffee clusters that I studied, as can be observed in Figure 2.2 (Costa Rica's Coffee Cluster). Coffee displays a similar structure to wine except that the raw agricultural product is a more fungible commodity, which leaves the individual coffee farmer in a much weaker position in terms of value added activities. Carranza et al (2012), Valenciano Salazar (2008), Diaz-Porras & Hartley-Ballesteros (2014), have discussed some of these concepts in the context of coffee, but not in the context of resilience, local development or agglomeration.

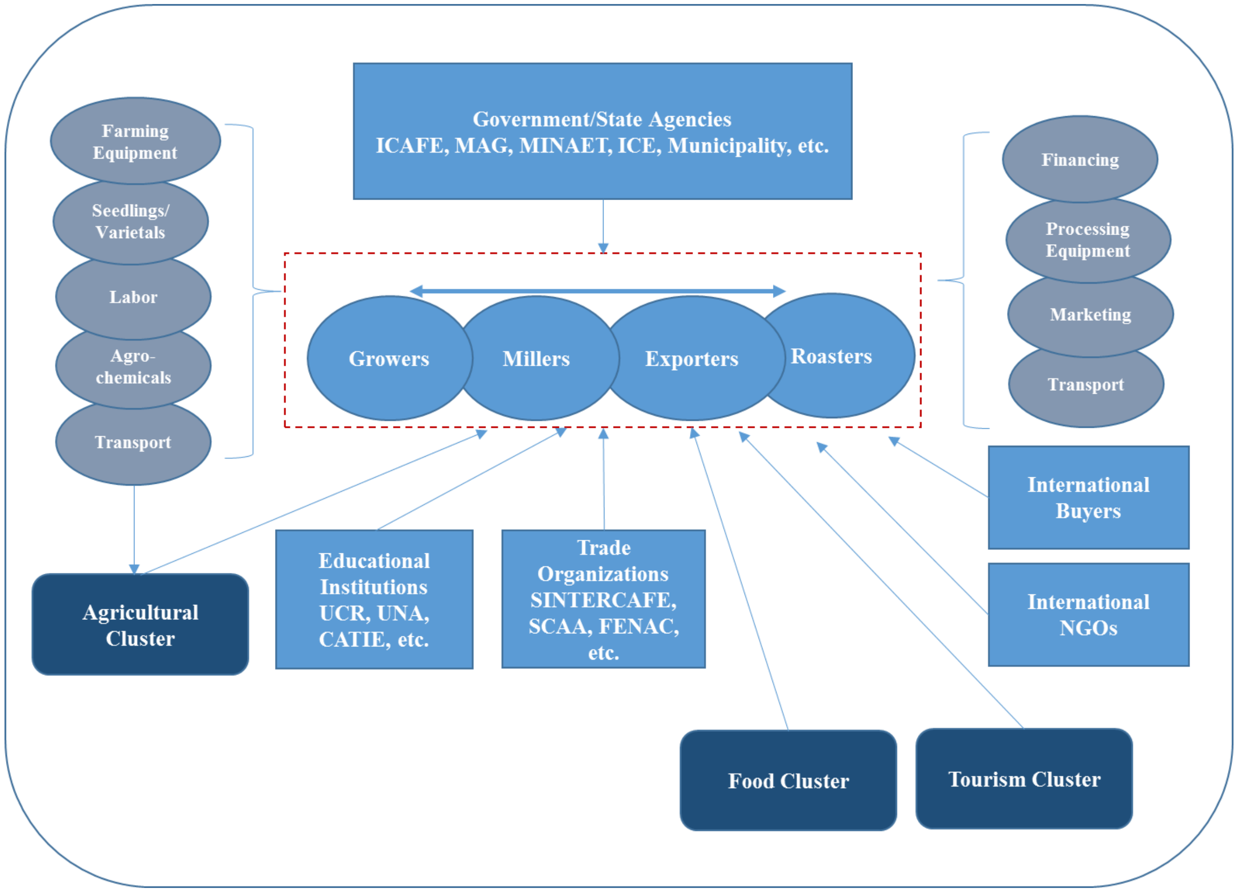

Figure 2-2 Costa Rica Coffee Cluster (based on Porter's schema)

In contrast to the idea of regions as a geographic envelope containing certain sets of local relationships and inter-related markets, Porter (2000) notes that clusters are a new scale of analysis different from the firm or the industry, where the competitiveness of a group of firms depends on shared aspects of a particular location. A cluster's geography includes, "...the distance over which informational, transactional, incentive, and other efficiencies occur." (Porter 2000, 16). This means that what defines a cluster is a matter of degree and depends on the scale of the networks of linkages between related firms and ancillary organizations. There is some question of scale within clusters. The scale of the California wine industry cluster identified by Porter is larger than that focused on in this dissertation. Here, I am interested in factors planners might influence, such as locally traded interdependencies (Strorper 1997)), so such a large scale is insufficiently focused on place. Moreover, many of the elements of cluster formation (common institutions, networks, etc.) vary at the local level, so the scale of cluster I use is much more localized. This is not a unique approach and other work on clusters in agriculture, especially with wine, uses a similar scale of smaller clusters, such as American Viticultural Areas (e.g. Napa Valley) within the larger super-cluster (Hira and Swartz 2016) or Chilean wine regions (e.g., Giuliani and Bell 2005).

2.4 Resilience in the Global Value Chain

Global Value Chain (GVC) theory is important in reorienting the discussion towards power relationships and inter-organizational networks of labor, production, and capital from the production of basic commodities to finished consumer goods (Diaz-Porras 2003, Diaz-Porras et al 2009, Hopkins and Wallerstein, 1994, Gereffi 1994). In the case of coffee, there is a hierarchical value chain: power rests in the hands of large multi-nation roasters, such as Nestle and Starbucks, and exporters. It is a processor-based chain, in the sense that local leverage lies with coffee processors, not small farmers, because "…power lies in supplying and processing key commodities" (Lee et al 2012, 12328) and a large portion of adding value happens through processing.

Resilience for a cluster in the context of the GVC is the ability to produce products in a certain territory and maintain long-term profitability in relationships with buyers and exporters, and to maintain a role and power within the global chain. For the most part, changes are top-down, but, even in a hierarchical system, innovation and profit creation are not totally one-way streets. A country, or region, can upgrade to higher value products through improvements in production capacity and knowledge and thus enter higher profit areas of a value chain system (Lee et al 2012), and here there is a clear link to the clusters literature and the importance of governance for competitiveness (Diaz-Porras 2003).

GVC analysis focuses on how value is added to products and where profits are distributed, both geographically and along the commodity chain of production. GVC analysis is about the "geography of value added." (Sturgeon et al 2013). When one talks about GVC four components stand out: 1) an input-output structure, 2) geographical considerations, 3) structures of governance and control, and 4) the institutional contexts of production in the industry (Ibid. 4, citing Gereffi 1995). Adger et al. (2009, 151) use the term *teleconnection* to describe the intersection between global and local networks.

GVC research starts from the premise that understanding relationships and dynamics in commodity chains requires disentangling linkages among "firms, workers, and consumers" and identifying how resources, profits, power, and information flow among these groups (Gereffi and Fernandez-Stark 2011). Pietrobelli & Rabelloti (2011) note that GVC analysis does not originate in the interactions among firms in a local cluster; rather GVC analysis identifies the pressures put on localities from the global organization of a industry or sector.[2] That is, the GVC model is the system in which clusters are resilient or fail.

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[2] Place is not a singular element of GVC, while it is a key element of most planning strategy and scholarship. Accordingly, Ponte's analysis is global in nature, and does not specifically examine the operation, organization, and diversity of local coffee production's interaction with the GVC.

In terms of the Global Value Chain, there are two main challenges in coffee clusters: 1) adaptation and upgrading in the context of ever greater differentiation in coffee qualities and 2) greater value capture in the face of competitive market forces and price fluctuation (Clarke & Ramirez 2013, Perez-Aleman 2012, Pelupussy and Diaz-Porras 2007, Carranza et al 2012). Due to this, global market forces are pushing production to regions that can meet these challenges (Rueda and Lambin 2013a). The specific forms of pressure exerted through these channels depend on the mix of local and international actors present in a cluster, and their priorities regarding "product quality, delivery time, efficiency of processes, environmental, labor, and social standards." (Pietrobelli & Rabellotti 2011, 1262). As such, the relationship of a local cluster with the GVC can create different types of path driven processes regarding environmental management, production cultures, or innovation, as a function of the values of those actors with most influence over local producers.

Alongside these relationship-driven purchasing channels is the enormous price pressure of the coffee commodity market defined in Latin America largely by C-Contracts (37,500 pound shipping container contracts that are the standard unit to describe trade in coffee) on the New York Commodities Exchange. Commodities prices are very low value added, and for producer-driven markets, such as wine and coffee, gaining power means escaping prices directly driven by daily futures markets by distinguishing one's product; this creates constant pressure to upgrade and specialize (Morrison 2008, Perez-Aleman 2012).

Up-stream purchasers now seek increasingly differentiated coffee, necessitating more upgrading in local clusters than when Central American coffee was a generic commodity product (pre-1989). Due to evolving international preferences, communities must upgrade production practices to obtain fair trade and environmental certifications, improve quality in growing and processing, and seek out direct trade relationships (Diaz-Porras et al. 2009, Perez-Aleman 2012). Marketing is bolstered by the development of local *terroir* reputations (Rueda and Lambin 2013a), which are built from the interaction of natural local characteristics (such as soil and climate), plant genetics, local production practices, and marketing. The local institutions that communicate and enforce quality standards have a key role intermediating between local farmers and powerful actors in the GVC (multinational commodities firms and roasters), and, to the extent that they can innovate and persist, they are essential players in a reciprocal three-way dialog with growers and powerful upstream market actors.

Because of small farmers' lack of power to directly sell to consumer markets, intermediaries, which have many more market connections, are crucially important for finding competitive outlets for local coffee, negotiating fair prices, and communicating information about the market back to the farmers. This is a common problem for small firms in other industries who must compete with powerful larger firms to equitably access resources in local industrial networks (Clark 2013). “[T]hose institutions that facilitate knowledge flows that build local producers’ capabilities are needed for sustaining growth in developing countries.” (Perez-Aleman 2010, 12344-12345). Upgrading may include both quality improvements and improved environmental management, such as increased levels of shade tree planting or conversion to organic production.

Given the hierarchical nature of the coffee value chain, upgrading depends upon farmers and intermediaries having accurate information about global market opportunities, sustainable production practices, and industry standards (Perez-Aleman 2005, Perez-Aleman 2008 & Perez-Aleman 2012, Muradian & Pelupussy 2005, Clarke & Ramirez 2013, Clarke 2011). This is typically a reactive position, but local innovation can change the structure of markets as has happened in the case of Chilean wines (Giuliani and Bell 2005, Giuliani 2007). What does appear consistently in the literature is the idea that upgrading and innovation require coordination with upstream actors, which in the context of small holder agriculture, may deepen inequality, because the upper echelons of rural populations frequently have greater capacity for relationship building and making investments to fill market niches. Thus, adaptation in areas of high degrees of local inequality may have a disruptive effect on collective action and inclusive clusters. From this point of view, explicit GVC oriented strategies, and intermediaries, have been criticized as potentially undermining the agency of small hold farmers (Vorley et al 2012).

I recognize this possibility, and use GVC as a framework for analysis, not as a prescriptive solution for development. Many of the adaptive strategies local actors must take to participate in global markets may exacerbate inequality and provide unequal benefits for poor farmers. In part, because of this reality, I am interested in when and how local coffee industries have agency to improve their position in the GVC. In this sense, we can think of resilience within global value chains from the perspective of a cluster's ability to over time in the context of Martin's four-part model (resistance, recovery, reorientation, and renewal), but one in which there is a constant pressure for the cluster to access more profitable market segments, and to capture more of the surplus value created in the value chain, and to defend these gains in the face of constant environmental and economic pressures. Resilience, is thus, a mix of productivity and market positon, which once lost can lead to long-term vulnerabilities for the local cluster.

2.5 Adaptive Efficiency and Clusters

Gordon and McCann (2000, 516) propose several theories about cluster dynamics relevant to this study, including pure agglomeration, industrial districts, and the social network (or club). While the agglomeration model can be seen through models of aggregate economic activity, the social network model of clustering is better explored through measurements of "... [joint] activity, mutual-support networks or common patterns of socialization, along with means of controlling membership of the network." (Gordon and McCann 2000, 529, Muller et al. 2005). Realizing that there was a need to integrate the idea of external economies with agglomeration and questions of local industry coordination, structure, and collaboration, Schmitz (1995) coined the term *collective efficiency*, which melded external economies with joint action.[3] These two concepts provide context for evaluating the role of actors and local organizations in governing connections between international markets and local industries (Giuliani & Bell 2005, Nadvi 1999, Schmitz 2004, Pietrobelli and Rabellotti 2007, Clarke & Ramirez 2013). Schmitz's later work has emphasized the importance of value chains (Humphrey & Schmitz 2002), and inspired work on cluster development in agricultural systems (e.g., Giuliani et al 2005, Morrison 2009). Visser and De Langen argue that local industries in

[3] Joint action is concerned with group formation and strategies that firms use to work collectively to obtain common goals (Clarke and Rodriguez 2013, Clarke 2011, Schmitz 1999, Schmitz 1995). The concept encompasses both vertical and horizontal collaboration (Schmitz 1997) and discusses institutional factors.

clusters organize around both “a network and a chain” (179). Much of this research has linked the correlation of adaptation and upgrading with 1) external economies related to agglomeration, 2) collective action, and 3) collective learning through local social networks (Giuliani 2013, 2015).

However, the collective efficiency model does not sufficiently incorporate institutional perspectives on the roles of social organizing norms and beliefs in determining long-term economic performance (North 1998 & 1993), or more importantly the governance structure of firms (Williamson 1985) that New Institutional Economics used. For this reason, I use the term *adaptive efficiency* taken from North (1990), who used it in the context of larger-scale long-term economic processes,[4] to focus on the underlying economic activity and social processes of learning and adaptation (Moroni 2010).

North’s conceptualization of adaptive efficiency is somewhat amorphous, but his focus on the long-term importance of institutional variation is important for understanding what about clusters can make them promote resilience or fail to do so. Accordingly, I use the term *adaptive efficiency of clusters* instead of the term *collective efficiency*, even though my model is based on this concept. This has two aims: 1) framing cluster-based research within a resilience or evolutionary framework (Boschma and Frenken 2005, Boschma and Frenken 2010, Frenken and Boschma 2010, Crespo et al 2012) and 2) making the key components of the model and their interactions more explicit by adding the importance of institutions.

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[4] He defined adaptive efficiency as, “an institutional framework that encourages experimentation when we run into new problem” (North 2008), with a special focus on rules and institutions.

Within the literature on clusters, this project attempts to unite literature about local industry networks (Saxenien 1990, Saxenien 1996, Storper 1997, Cook and Morgan 1998, Clark 2009), with work on cluster performance centered on social network theory (Schmitz and Navdi 1999, Uzzi 1996 & 1997, Rabelotti 1999, Bathlet et al 2004, Giuliani & Bell 2005,b Giuliani 2013) and the importance of institutions (Porter 2000, Moroni 2010, Martin 2014). I frame these factors in terms of the challenge of maintaining resilience in Global Value Chains in the face of market and environmental pressures and shocks. Prior studies have found that coffee landscapes "…changed in response to exposure to global market trends as the regions with the environmental, economic, *and social conditions* (emphasis added) that were most appropriate to increase production of sustainable and high-quality cup profile coffee experienced the greatest increase in area planted." (Rueda and Lambin 2013a). This suggests that local organization interacts with pre-determined conditions to create capacity to build niches in the international coffee market. The concept of *adaptive efficiency* is the conceptual bridge to understanding how the structure and function of local clusters impacts resilience.

The adaptive efficiency model attempts to provide a framework for understanding how cooperation via social networks, spatial concentration, and local institutions (in the organizational sense) are important for long-term industry resilience. This is important for regional coffee industries because of the constant pressure to upgrade and compete in global value chains (Humphrey & Schmitz, 2002), in the wake of liberalization of coffee, the subsequent "latte revolution" (Ponte 2001), and the current third-wave period, where "terroir" (Rueda and Lambin 2013) and producer-level marketing (Emory Transparent Trade 2016) are increasingly important.

The term *adaptive efficiency of clusters* includes three interconnected components: spatial agglomeration, relationships, and institutions. The following discussion will connect existing literature to each of the three factors in my proposed *adaptive efficiency* model.

2.6 Adaptive Efficiency Model Elements-Spatial/Agglomeration Factor

Agglomeration factors focus on the benefits of concentrating economic activity. New Economic Geography (NEG) has emerged as scholars try to understand agglomeration's effect on economic growth using spatially explicit methods to reintroduce the idea of space into thinking about growth and economic performance (Krugman 1990, Krugman 1991, Krugman 1998, Fujita et al. 2004, Ellison and Glaeser 1994, Glaeser 1990, Owen-Smith 2004). Almost all agglomeration economies and NEG research focus on urban settings, where some scholars argue that industrial location is less than 20% natural advantages (Puga 2010, Ellison and Glasear 1999), meaning that the organization of the local cluster is a major determinant of economic performance. By including agglomeration factors in my model, I am extending NEG to the context of agriculture.

Ellison and Glaeser (2010) describe the advantages of Marshallian agglomeration as "proximity to reduce the costs of moving goods, people, and ideas," and contrast these to "natural advantages." They use a large model that includes the following factors for assessing the benefits of agglomeration: Proximity to Customers and Suppliers, Labor Market Pooling, Intellectual or Technology Spillovers, and Natural Advantages (Ellison and Glasear 2010, 1200-1203). Marshallian agglomeration economies, commonly referred to as Marshall-Arrow-Romer (MAR) spillovers, are closely associated with explaining the role of knowledge in economic performance (Glaeser 1991 citing Marshall 1890, on industrial districts, and Arrow (1962), on endogenous growth, later formalized by Romer 1986, 1990, 1994). MAR agglomeration theory also suggests that clustering may occur because of cost savings from better local labor pools (Gordon and McCann 2000, Garrett 2013, Muller et al. 2006), and the savings that come from external economies due to competition between many suppliers of materials and increased transportation facilities (Rueda and Lambin 2013a, Fujita et al. 2004, Fujita et al. 1999, Krugman 1999, Krugman 1996). The MAR model generally looks at intra-industry spillovers, while Jane Jacobs developed a competing theory based on economic diversity and inter-industry spillovers (Vander Panne 2004, Beaudry and Schiffauerova 2009, Glaeser 1991, Jacobs 1969).

Accordingly, in this project I study localization economies, or the benefits of the concentration of an industry (Rosenthal and Strange 2004). The challenge in identifying whether an industry benefits from agglomeration is to separate natural advantages from advantages that arise from spatial concentration. Doing so requires identifying the mechanisms of agglomeration, including transportation costs, dense labor markets, and cities and ideas (Glaeser and Gottlieb 2009). Eisenreich et al (208, 339) categorizes these as economic efficiencies from clustering ("increased specialization, reduced transaction costs and enhanced reputation."), dynamics of knowledge (knowledge transfer following Bathlet et al 2004, Malberg and Maskell 2002), and social networks (following Granovetter 2005, Uzzi 2006, and Schmitz and Nadvi 1999).

Other authors suggest that these factors, together, can lead to innovation and startups, inter-firm competition, and capacity for collective action (Boschma 2005 and Boschma & Frenken 2010). Moreover, spatial proximity is important for face-to-face interactions that build the sort of tacit knowledge first described by Michael Polanyi (1996), that would later underpin ideas around territorially bound innovation systems (Storper 1992, Storper 1997, Gertler 2002 & 2003).

Despite the importance of these ideas in regional studies, my literature review has found few studies that focus on the role of spatial concentration in agriculture. There is some question of the applicability of the concept of agglomeration or localization to agricultural districts because they, at least in part, seem to emerge from obvious natural advantages. However, there is a secondary question of whether aspects of co-location and industry concentration provide long-term self-reinforcing advantages for agricultural areas. The ideas of New Economic Geography have recently been applied to understand differing trajectories of soy growing regions (Garrett et al. 2013), finding evidence of spillovers. The initial clustering of an industry is positively buttressed by the further clustering of related firms in a supply (or value) chain, creating a series of production and marketing efficiencies that circularly reinforce the initial location.

Accordingly, initially privileged locations receive a secondary benefit from agglomeration helping to form and maintain production clusters, as well as producing spillovers to other local economic activity (Garrett et al 2013). However, other studies have found that agriculture can crowd out other industries, limiting Jacobian agglomeration economies (Hornbeck and Keskin 2012), but this research is primarily concerned with intra-industry spillovers, and locational advantages (such as reduced transportation costs) rather than spillovers to other industries, especially how coffee landscape dominance interacts with the systemic integrity of the cluster's industrial function.[5]

In terms of agglomeration, there is a gap in the literature regarding how "the gains from concentration" work in agricultural systems: specifically, what are the key institutions in facilitating concentration, and how do they vary in different contexts (Garret et al. 2013, Clarke & Rodriguez 2013). There is growing interest in the importance of local agricultural supply chains for promoting agglomeration to help retain local agricultural production by reducing costs and achieving location-specific production economies and improving knowledge networks (Perez-Aleman 2005). This study is designed to add to the understanding of spatial concentration dynamics by connecting agglomeration research to economic geography of clusters (Garrett et al. 2013, Clarke 2011, Giuliani and Bell 2005) and relating it to the other factors in my *adaptive efficiency* model.

2.7 Adaptive Efficiency Model Elements-Relational: Social Capital

2.7.1 Social Networks and Clusters

Recognition of the importance of *relational factors*, is based on social capital and social networks theories (Putnam 2005, Granovetter 1975). Social capital impacts local resilience to market and environmental shocks and stressors (Adger 2000). The concept of *social capital* "…. describes relations of trust, reciprocity, and exchange; the evolution of common rules; and the role of networks…," all of which are crucial for collective action

[5] Describing resilience in coffee communities requires taking into consideration inter-industry spillover effects and the ability of declining coffee regions to translate to other environmentally sustainable land uses.

in the contexts of interactions between policy bodies, markets, and individual actors (Adger 2003, 389, Woolcock and Narayan 2000). Social capital is the result of the "networks and flows" of information and power among individuals. The structure and function of these networks defines capacity for collective action and is highly dependent on levels of trust among actors (Gertler 2002, Porter 1993, Sabel 1993, Putnam 1995). Social network relationships explain how "...the individual or collective actions of the group differ from the behavior associated with either pure market-contracting or hierarchically organized relationships." (Gordon and McCann 2000, 520, Granovetter 1995 & 2005). Within literature on value chains, the relative importance of local collaboration and locational advantage, are have long been debated (Visser and De Langen 2006).

Relational factors are important for the mission of planners concerned with devising new strategies to build capacity for governance in an increasingly decentralized and networked world (Innes & Booher 2010, Castells 2001), especially in terms of sustainable economic development. Local networks are important in this context, especially for innovation, because social capital supports intellectual capital (Nahapiet & Goshal 1998) and economic growth (e.g., Putnam 1995, Heilwell and Putnam 2005, Woolman et al. 2000, Collier 1998) by enabling local knowledge and collaboration networks, and is thus crucial for upgrading in GVCs. Within local clusters, *untraded local interdependencies* (Storper 1997), as well as relationships and trade within the supply chain, become "region specific assets" that can drive an industry's geographical distribution beyond individual firm or farmer attributes (Bathelt and Gluckler 2003, 129). Furthermore, the structure of local knowledge networks in clusters and with external actors may impact resilience (Crespo 2013).

These arguments build from Grannovetter (1995) and Uzzi (1996, 1997) postulating that the clusters are most distinguished by inter-organizational relationships among actors within the cluster, and bridging relationships outside of the cluster (Eisengerich et al 2010). A contribution to *adaptive efficiency* is achieved when actors in local clusters make knowledge flows more reliable and improve coordination among firms above and beyond Marshallian external economies (Clark et al. 2010, Boschma 2005), which help build knowledge, skills, and institutions-based commons. Local production networks are self-organizing systems that depend on social relationships among producers within the cluster (Putnam's bonding capital) and bridging capital between local actors and different nodes of influence in the global value chain. As such, local knowledge networks are crucial for upgrading and sustained competitiveness in the global coffee market (Perez-Aleman 2012), because firms "participate in both clusters and value chains."

2.7.2 Social Network Measures

Social network measures can help uncover power in firm networks by documenting how strategically placed actors control the flow of information and resources between local innovation systems and the GVC (Pietrobelli and Rabelloti 2011, Sassen 2006, Castells 2001 (in Castells & Susser 2004). Eisengrich et al (2010) note that while both network strength ("frequency, intensity, and stability") and openness (diversity, openness to new entry, and extra-cluster relationships) improve cluster performance over time, openness may be especially important for adaptation and change in periods of uncertainty, while long term value chain relationships require "…trust between buyers, producer organizations, and lenders." (Parizat et al 2015,100).

Framed this way, there are two essential concepts for assessing local networks that guide the analysis in this project: *network strength*, which is associated with Putnam's bonding capital, and *network openness*, which is associated with Putnam's bridging capital (1995), and often depends on what Granovetter would call "weak ties" and ease of entry (Eisengerich et al 2010). The strength of the local network (Eisengerich et al 2010, 240, Schmitz and Nadvi 1999) primarily measures horizontal interactions among local actors (Gulati 1998). The openness of a network measures vertical relationships with non-local actors.

The analysis of social networks based on strong local ties gels well with clustering theory (Eisengerich et al 2010, CEPAL 2005), while the openness of a cluster complements GVC literature (Bathlet et al 2004, Morrison et al 2008, Ponte et al 2009), because external ties are often mediated by brokers (Burt 2001), who are able to use their positions at strategic points in the value chain to capture surplus value (Brown et al 2010, Derruder et al 2010). Strong local networks "mobilize information, resources and knowledge on risk management." (Eakin et al. 2012, 483).

One of the key components for network strength is *trust*, which reduces transaction costs and is central to the network's ability to work towards "common mutually beneficial goals." (Gordon and McCann 200, 521, Granovetter 1973, Ter wal and Boschma 2009)). Trust and reciprocity within members of a community (or potentially an economic cluster) allow for social networks of collaboration to form that enable productive relationships furthering development (Putnam 1995, Aragwal et al. 2009). Firms benefit from social capital when trust reduces transaction costs and creates knowledge exchange (Uzzi 1997), and to create intra-cluster spillovers from new knowledge and resources (Eisengerich

2010). Cluster level collaboration is crucial for quality production practices (Visser & De Langen 2006) and also for coalitions to promote sustainability within agriculture (Lubell et al. 2011, Shaw et al. 2009). This may have strong impacts on path dependent processes regarding environmental management, sustainability values, and quality upgrading within the cluster.

Strong local ties are also important for collective action related to resilience because actors in networks with strong ties "(i) influence one another more than those sharing a weak tie; (ii) share similar views; (iii) offer one another emotional support and help in times of emergency; (iv) communicate effectively regarding complex information and tasks; and (v) [are] more likely to trust one another." (Prell et al. (2009, 503) Additionally, network strength impacts the knowledge component of resilient adaptation.

Productive knowledge is often tacit and shared in tight networks (Nahapiet and Goshal 2008), which help "...overcome some of the major constraints they usually face: lack of specialized skills, difficult access to technology, inputs, market, information, credit, and external services." (Giuliani and Bell 2005, 550). Clusters create "localized capabilities" for innovation expressed as a "local buzz," which is a local common pool resource to produce "sticky" knowledge shared between local actors (Ibid., 37-29, Storper 1997).

However, innovation also involves connection to "external pipelines," and external links are important for innovation and access to resources in the developing world (Bathelt et al 2004).[6] Thus, a cluster's openness and capacity to connect to outside networks is important for efficient and resilient relationships higher up the GVC and with sources of outside knowledge.[7] (Eisengerich et al 2010, Morrison and Rabelotti 2009, Giuliani and Bell 2005, Giuliani 2013). This "extra-cluster networking" helps clusters innovate and seek greater surplus value within the coffee GVC (Giuliani and Bell 2005). In the case of clusters, internal bonds and relationships promote agglomeration economies (Giuliani 2005), while bridging capital may help clusters promote adaptation and innovation through connections to new ideas and resources (Giuliani 2013)[8]. Furthermore, in environments of greater uncertainty, network openness may promote adaptation, which may come from new members or new extra-cluster relationships or ideas (Eisengerich et al 2010).

In sum, the structure of local cluster networks enables effective *cluster governance* (Visser & De Langen 2006, 178) and performance (Uzzi 1997, Eisengerich et al 2010), impacting resilience (Crespo 2013, Clark 2013). This dissertation develops the proposition that social capital is a public good (Adger 2003) that contributes to adaptive efficiency with the idea that networks of power in local firm networks determine resilience. Thus, just as

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[6]They often interrelate with the idea of regional innovation systems (Cooke 2001).

[7] For example, in the coffee industry, brokerage roles are of central importance, both in terms of facilitating market transactions, but also acting as conduits for new knowledge and innovation (Burt 2004, Granovetter 1973, 1983, Derruder 2010). In coffee, as in wine, certain key institutions will act as gatekeepers for knowledge at the local level (Giuliani and Bell 2005 and 2008), and also for market access and financial resources (Ponte 2002). Some literature notes that clusters depend on gatekeepers of knowledge (Giuliani 2007), while others are more horizontal (Morrison and Cassi 2009). Highly centralized clusters may suffer if key actors are inefficient or fail, or have less innovative ideas (Burt 2004, Uzzi 1997). Because of the importance of brokerage with external markets, those firms with denser connections outside of the cluster should be the leading intermediaries.

[8] Sturgeon et al. (2008) note that tacit knowledge is often exchanged and developed locally, while "codified" knowledge tends to come from outside of clusters via formal relationships.

important as those commons that involve natural resources, are those social commons built around shared social organization, which can be more or less equitable and more or less resilient. This is similar to the idea of the "industrial commons" composed of "knowledge, skilled people, and supplier infrastructure" that together create collective capabilities for competitive economic activity. (Pisano and Shih 2009, 2-3).

2.8 Adaptive Efficiency Model Elements-Institutional: Land Tenure, Culture and Firm Structure

Finally, the *adaptive efficiency* of local clusters is affected by local institutions, which shape how local actors collaborate and interact with external markets and reciprocally among themselves. Social networks facilitate the kind of capacity for collective action that promotes adaptation and resilience to both market shocks and ecological disasters. But networks themselves are insufficient for clusters, which require that local firm networks create an emergent governance system at the regional level (Cook and Morgan 1998). Without strong governance institutions and links to actors at other points in the vertical commodity chain, access to their resources may not be readily available, especially in rural areas of Latin America, and moreso in areas that face cultural barriers to markets and market governance institutions.

Rodriguez-Pose (2010) describes *institutions* as the rules of the game, whereas *organizations* are the actors. Institutional economics introduced the concept that neoclassical ideas of efficient markets overlook the "informational and institutional" organization of society in terms of how the economy works (North 1993, 5 www2.econ.iastate.edu/tesfatsi/NewInstE.North.pdf). These are rules and norms by which economic organizations and units, as well as the interdependencies among individuals, are structured, and North noted that they were key elements of long-term learning and path-dependent change (North 1993, North 2003). This line of research has tended to be at the national or economy-wide level. However, we know that effective local organizations (or institutions in the non-norm-based sense) are central for long-term competitiveness, because they channel power and can promote adaptive modes of production in agricultural industries.

There is considerable debate about institutions versus organizations, but follow the idea of that organizations are a type of institutional structure (Hodgston 2006). For example, the idea of a regional industrial system includes "regional institutions [referring to organizations] and culture, industrial structure, and corporate organization." (Saxenien 1996, 7). This includes forms of structuring conventions that may be seen as both formal and informal institutions, and while these component parts are frequently uncoupled in terms of categorization, especially in terms of culture (Alesina and Giuliano 2014)(http://scholar.harvard.edu/files/alesina/files/cultureandinstitutions_jel_2014.pdf) they share the common denominator of structuring behavior and routines. Institutions can, following Martin and Sunley (2006), participate in the process of creating the direction of development and in some cases path creation (MacKinnon et al 2013) or reinforce path contingent development. Institutions are at the same time historical elements impacting clusters and evolving systems constructed by the rational choices and subconscious routines of local actors. Because of my view of institutions as evolving systems, the larger definition of institutions (merging both formal and informal institutions) is what I use here, which included the conventions of corporate organization and embedded cultural identity.

Clusters, or regional systems of production and innovation, are diffuse firm super-structures bound together by, "a set of institutions – public and private, formal and informal – which facilitate the close interaction necessary to support innovation-based …production…", and help build a collective order (Gertler 2002, 111-112). If a cluster is seen as a self-organizing meta-organization, then the firms are cellular institutional components of a larger entity, which itself is part of institutional systems at other scales. In this sense, the variation of conventions (instances of institutional configuration) among firms institutionally structure firms, and the aggregation of these at the cluster level, structures the cluster.

While institutional configurations of the collective order in a cluster foster trust and social capital, they are also important in structuring the relational elements of knowledge exchange and innovation, which are important for social learning and adaptation (Gertler 2002), thus the importance of institutions, or local conventions (Storper 1992), for local governance systems (Cook and Morgan 2008) and cluster governance (Visser and De Langen 2006). They have an important sociological and cultural impact on local economies (Hall and Taylor 1996), and how Saxenien's idea of regional advantage based on variations in "local institutions and culture (which shape shared practices and understandings),[9] industrial structure (the social division of labor), and corporate organization and culture…" impact local industry systems (Gertler et al 2005, 200, Storper 1997, Saxenien 1994 and 1995).

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[9] Here Saxenien lists culture as apart from institutions, but grouped together in a list of factors influencing regional advantage. I argue that she is really grouping culture under institutions, broadly framed, as structuring edifices in clusters.

The priorities of the power and incentive structures underlying local institutions may lead to very different priorities in clusters regarding what types of production practices to follow and the degree of commitment to issues of public importance, such as environmental innovation within the industry. Furthermore, national systems impact local systems providing nested levels of institutional governance, and it is thus important to understand institutional variation in sub-cultures in their embedded location within national systems (Gertler et al 1995, Nelson 1992). Cluster networks are also frequently defined by power imbalances between small local firms and transitional companies, which can lead to a loss of resilience if small locally embedded actors are pushed out by "foot-loose" global actors who are able to control networks of resources and knowledge (Cristopherson and Clark 2009, 6-8 "Premise Two", Clark 2013). Institutional structures promoting locally embedded power in clusters may allow them to better negotiate power in value chains, where roasters hold most of the power (Gutierrez-Rincon 2014).

In this project, I study variations among three types of institutions in coffee clusters. I document how variations in (1) land tenure, (2) culture, and (3) intermediary firms impact adaptive efficiency.

2.8.1 Land Tenure

Property rights impact the behavior of economic actors, and thus are tightly entwined with the *adaptive efficiency* of local clusters (Alston and Libecap 1996). De Soto (2000) and Kerekes and Williamson (2008) argue that insecure tenure impacts economic development, especially in Latin America. Communal or undefined tenure diminishes investment incentives and makes credit difficult to obtain, but the conversion of once socially held land to freehold tenure has social costs and may lead to instability in agricultural systems (Feder and Feeny 1991). Within this concept the idea of a public interest over a landscape of privately held property raises the issue of incentive problems for individual farmers and coordination problems for promoting collective action (Shaw et al. 2011). Studies on deforestation in Mexico have found that tenure security, not tenure form, has the greatest impact on stable land uses (Robinson et al 2013). However, secure private tenure can lead to greater access to credit (Ibid.), and it may lead to greater community commitment to environmental stewardship.

In areas where tenure is communal or insecure farmers often try to improve the security of their holdings (Besley 1995, Besley 2000). Secure tenure and title may lead to more investment in farm productivity (Alston and Libecap 1996), and it may lead to greater incentives for the investment necessary for multi-year crops, such as coffee (Do & Iyer 2003, 2008). The longer time horizon for coffee cultivation may also condition environmental management practices by creating incentives for conservation that can lead to long-term socio-ecological resilience in coffee systems.

2.8.2 Culture

Ideology, or culture, has long been recognized as an important factor in long-term economic performance (North 1993). Variations in shared histories and cultures at the regional level are important, especially in periods of paradigmatic shifts, although they are slow to change (Saxenien 1994). Cultural commonality facilitates interchange of information and knowledge with deeper levels of meaning, and shared conventions define local production systems (Gertler 2002, 76, Granovetter 1985, Storper 1992). These conventions can greatly influence the local uptake of technology or participation in markets, and thus, social institutions impact how global industries operate locally (Gertler 2002). In the case of the value chain for coffee there is significant cultural distance between producers in Latin America and multinational commodities firms based in Singapore, USA, Switzerland, and USA. Hsu and Saxennien (2000, 1993), building off Lundvall (1996), suggest that "[s]hared language and culture can also help producers, even those located at great distances, gather information about people, capital, and other resources within the community," In contrast, linguistic and cultural differences can be a major barrier, creating enclaves, which though "…good strategy[ies] for survival, it is a bad arrangement for global competition." Culture and language can be barriers for forming weak ties (Granovetter 1985) or bridging social capital (Putnam 1995), but they also might, in the case of minority populations, represent histories of conflict, with both internal and external divisions.

Seen from this perspective, language and culture can be significant cultural barriers in the GVC, but they can also be, potentially, mechanisms for building local solidarity and capacity for collective action, especially in marginalized populations. Indigenous moments have used alternative trade models as a means of resilience and community empowerment (e.g., Martinez 2007). However, where actors in the global value chain operate in diverse cultural and linguistic contexts, they will depend on local intermediaries to broker relationships, and the success of the intermediaries may depend on capacity to reduce transaction costs for communication and build trust. Culture can be a barrier when it is tied to histories of exploitation and colonialism that created economic classes and structures, as is the case with indigenous communities in the Americas, especially in the case of agriculture. In this sense, the institutional aspect of culture that this dissertation addresses is not the cultural practices and identities of the communities, but how these are positioned within economic and political structures. The legacies of colonialism and racism manifest themselves in the continued institutional marginalization of indigenous communities within traditional economic structures.

2.8.3 *Firm Structure*

In part, this project focuses on the effect of coffee intermediaries, which, when observed alone, are organizations, but when seen as a coordinating class of actors, have a cumulative impact that creates an institutional structure for the local industry, in terms of the rules and norms of territorially influenced routines and rules (Rodriguez Pose 2010). In developing economies, intermediaries play central roles in improving quality and connecting local actors to resources (Clarke and Ramirez 2013), and thus in path creation (Martin and Sunley 2006) or steering the existing route. Governance of rural coffee communities in Latin America occurs primarily through local industry leaders, NGOs, cooperatives, and environmental and social certifications (Muradian and Pelupussi 2005, Bacon et al. 2005, Baldasarri 2013, Whelan 2008, Wollni and Zeller 2007, Blackman 2008a, Ellis et al. 2010, Alvario and Blackman 2009, Castro et al. 2004, Millard 2011, Eakin et al. 2006, Eakin et al. 2012, Frank et al. 2011).

In rural Central and North America, national level policies such as ICAFE's governing law in Costa Rica and legislation regarding cooperatives provide the framework for organizations to use local social capital for their formation and execution. However, the level of planning and support for coffee production, innovation, and farm preservation from local governmental authorities is generally minimal. In such a context, Baldassarri (2013, manuscript in review) argues, “emerging patterns of social relations [help to] overcome collective action problems by facilitating the spread of information, trust, and accountability practices.”

Responding to environmental challenges and competition in the differentiated coffee market requires innovation and upgrading (Kaplinsky 2002, Porter 2000, Bathlet et al 2004) which may be fostered by strong local institutions, in the organizational sense (Perez-Aleman 2005, Clarke 2013); these local institutions may also assist farmers in retaining a larger portion of value from the product in negotiations with powerful supply-chain actors (Brown et al 2010), and also in creating a stronger local support system.

Existing research suggests that local intermediaries contribute to agglomeration and sustaining the local coffee cluster by improving individual farmers’ economic base and by connection to the industry (Clarke and Rodriguez 2013, Perez-Aleman 2000, Giuliani 2013). This dissertation builds on that work and proposes that *locally anchored* intermediary institutions (*beneficios* -- or processing mills) can coordinate behavior in a way individual farmers are unable to, because they have more economic power and ability to coordinate collective action. The *beneficios* differ markedly from one another in their role within the cluster per their ownership structure. [10]

2.8.4 Ownership Structure

[10] Another key role intermediaries is to represent local interests in advocacy with governmental organizations. Rueda and Lambin (2013a) found that the national coffee body of Colombia (Federación Nacional de Cafetaleros) played a crucial role in upgrading the quality of Colombian coffee. Local intermediaries are ideally situated to promote governmental initiatives and promote infrastructure improvements.

In coffee, processing mills are key actors that play an intermediary role between producers and the global value chain[11]. As intermediaries, the mills perform important functions related to knowledge: access, diffusion, coordination, and adaptation to new context or processes[12] (Clarke 2011, 52). Through these mechanisms the institutional structures of coffee mills in local clusters mediate the balance of collective goals and individual interests at the local level, which are in constant tension in the "political arena" of organizations (Brass et al 2004, Ostrom 2000). In local industry networks, powerful actors, backed by international investments, often can manipulate industry networks to favor themselves over smaller actors (Christopherson and Clark 2007), acting as external stars (Morrison & Rabelotti 2009), rather than beneficial gatekeepers of knowledge and resources (Giuliani and Bell 2005).

Mills operated by multinational companies in Costa Rica are often footloose, entering and leaving regions along with market trends. In contrast, farmer-owned coffee cooperatives are immobile and geographically linked to local production clusters. Institutions with non-market orientations often ameliorate some of the destructive aspects of competition among firms (Markusen 1996), and variations in the institutional profit motives of leading firms may change the structure of a cluster. Cooperatives have a strong social mission to promote community development and well-being among their members.

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[11] The institutional types of mills in the present study are: 1) Hub-spoke multinational regional mills (Multinationals), 2) Classical cooperatives (Cooperatives), 2) Newer producer's associations (Associations), 4) Private Local Mills (Privates), and 5) Micromills (Micros). These definitions are country specific.

[12] Another key role intermediaries is to represent local interests in advocacy with governmental organizations. Rueda and Lambin (2013a) found that the national coffee body of Colombia (Federación Nacional de Cafetaleros) played a crucial role in upgrading the quality of Colombian coffee. Local intermediaries are ideally situated to promote governmental initiatives and promote infrastructure improvements.

They return profits to their members (the growers), only keeping fees for operations and capital investment. Because of their ideological and social underpinnings, cooperatives may hold farmers in coffee production despite low profitability due to a sense of solidarity (Wilson 2013).

Baldassarri (2013) hypothesizes that cooperative governance helps initial cluster formation by providing guarantees to individual farmers that there will be sufficient pooled resources to bring their product to market before a strong cluster of independent firms is formed incentivizing private intermediation. In contrast, private owners have strong incentives to maximize their own share of the surplus value created from coffee growing relative to the share paid to farmers. This does not necessarily exclude the possibility of stable long-term relationships between private intermediaries and growers. However, through vertical integration for the benefit of individual farmers, cooperative coffee *beneficios* are in position to return a greater part of marginal profits to growers, invest more in innovation, and dedicate more resources to reputation building. Accordingly, cooperatives tend to show resilience as organizations in times of crisis (Birchall and Ketilson 2009, Birchall 2012, Borda-Rodriguez and Vicari 2013). Furthermore, even while some cooperatives are dominant in terms of power within local production networks, they may be more equitable in their distribution of knowledge and resources than privately held transnational corporations because of their long-term commitment to production in a particular area. Cooperatives have also been pioneers in spreading sustainability certifications within coffee, which may signal a stronger commitment to environmental stewardship, again due to an institutional structure that mandates they have a long-term commitment to local wellbeing (Wollni 2010).

The literature suggests that cooperative ownership of intermediaries has the potential to create more resilient clusters in terms of innovation, retention of land use dedicated to coffee, improved environmental practices, and farmer retention. Cooperatives improve farmer access to information, increase bargaining power, and can bring down the transaction costs of learning (Wollni et al. 2010, 375-376, Valintinov 2007), providing farmers with more surplus value in the global value chain. One study in Honduras found that individual farmers acting as members of cooperatives use better agricultural practices than a large commercial farm model (Mendez et al 2006). This observation is echoed in Italian studies of wheat production, where regions with more cooperative governance also had greater levels of biodiversity in varietals (Di Falco 2005). In Uganda farmers that are cooperatively organized often had more social ties at the community level and showed less isolation (Balldassari 2013). Costa Rican farmers who are members of cooperatives tended to display behavior more consistent with Putnam's bonding capital and were more likely to be altruistic with other cooperative farmers than those outside of the group (Hopfensitz and Miquel-Florenza 2013).

Wollni et al. (2007) conducted a random sample of 217 farmers in Valle Central Occidental (Central Valley West) and Coto Brus (South) areas of Costa Rica and found that in these areas, farmers in cooperatives reported receiving higher prices than their peers who did not sell to cooperatives. Participating in specialty coffee was particularly associated with higher prices, and cooperatives aided such participation by providing information and liquidity (Wolni et al 2007). Bossellmann and Lund (2013) noted that in the context of a payment for ecosystem services program in Costa Rica, cooperatives and extension offices were more inclusive bodies for small farmers than were NGOs. This literature suggests that cooperatives perform functions and foster certain social conditions that preserve family farms. However, cooperatives in poor communities often lack capacity and capital (Wollni 2012, Eakin et al 2006, Eakin et al 2012), and as communities become wealthier, commitment to agriculture and mutual support drop (Wollni et al 2012).

Despite the research suggesting a correlation between cooperatives and survival of coffee agroforestry systems (Blackman et al 2008, Blackman et al 2012, Rueda and Lambin 2013), little is known about the mechanisms through which they produce spillovers at the local level. Through case studies and social network analysis my project adds to understanding about whether and how the institutional context created by cooperative coffee mills impacts collaboration and collective capacity to respond to shocks to the industry, such as sudden price drops or diseases, and long-term challenges, such as structurally low prices and changing population dynamics. This research sheds light on whether cooperatives have structurally different roles in local firm and production networks than private mills, and whether regions in which they predominate have different levels of social capital, more equal knowledge and resource networks among firms, and greater capacity for collective action as a result.

CHAPTER 3. CONCEPTUAL FRAMEWORK

The Global Value Chain (GVC) for coffee influences the location of farming and modes of production, dynamically influencing the landscape of production according to the priorities of international buyers (Rueda and Lambin 2013). To sustain local clusters, localities must be able to effectively upgrade and adapt, which requires networks of knowledge and collaboration, both at the local level and with external actors (e.g., public agencies and multinational corporations) (Humphrey & Schmitz 2000, Humphrey & Schmitz 2002a&b, Giuliani et al 2005). This dissertation will compare how variations in patterns of knowledge and collaboration networks and relationships to powerful economic actors help to explain the long-term variability in success of different firms and clusters within GVCs.

This model describes how industries operating within bounded territories, sub-clusters and clusters, maintain resilience, or fail to be resilient, during periods of global industry change and environmental pressures. I propose that resilience for a local industry is the ability to maintain a locally beneficial place within the Global Value Chain (GVC) for its core products (See Figure 3.1 (Red Line) below). This model explicitly highlights the Institutional component of joint action, (which is not included in collective efficiency) describing ways that the structure and efficacy of local institutions are fundamental for the other factors in the model. Within the model, Relational Factors include both horizontal intra-cluster cooperation and also relationships between the cluster and extra-cluster actors, often more powerful GVC actors, or external bodies concerned with governance. Spatial Agglomeration Factors impact cluster resilience, as does social capital measured through relational networks and promoted by strong anchor institutions that encourage innovation and social commitment to coffee agriculture, and greater connections to the GVC.

Resilience, then, depends not only on the macro and firm characteristics, but also on the characteristics of the production cluster. The model as a whole can be seen Figure 3-1.

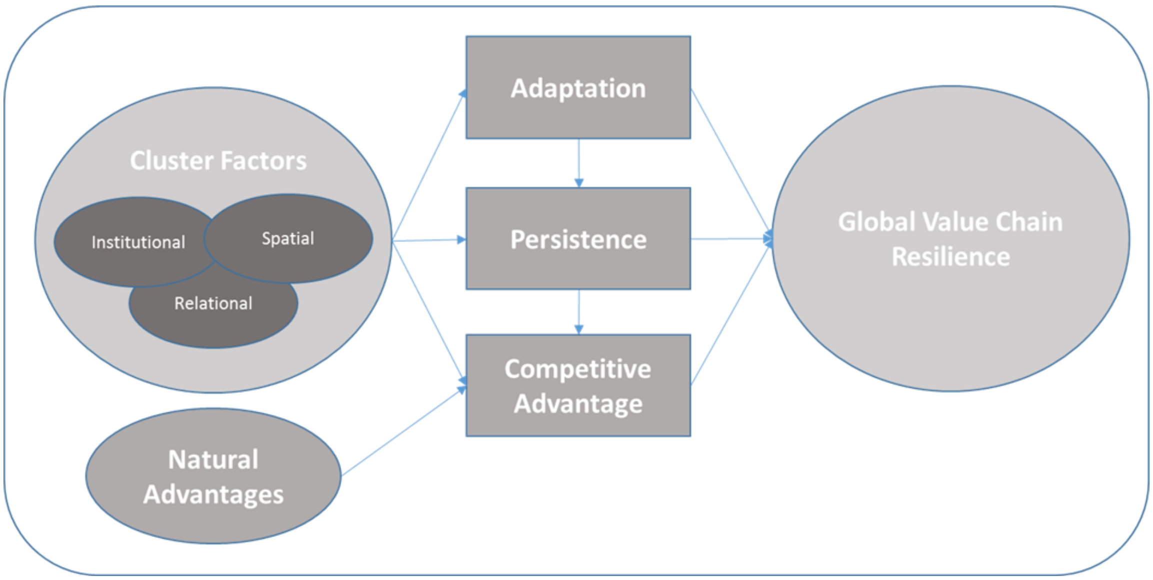

Figure 3-1 Adaptive Efficiency and Resilience in the Global Value Chain

3.1 Model in Light of Literature Review

Answering questions about what sort of 'adaptive capacities' make regions resilient (Clark 2013, Loc. 371) requires knowing what types of local governance regimes and forms of geographic organization help producers gain more value, produce more efficiently, incorporate sustainable environmental practices, and access networks of innovation and capital resources to overcome problems like *coffee rust* and chronic price instability. Here the concept of *collective efficiency*, which emphasizes "the competitive advantage derived from local external economies and joint action" (Schmitz 1995) is an important building block, but I break *joint action* into institutional and relational factors following Perez-Aleman (2005) and Giuliani & Bell (2005) in order to understand the elements that vary among clusters. My model frames issues of cluster governance within the concept of "resilience within global value chains," recognizing the need to understand systems of adaptation and the role of regions within networks of global trade (Storper 2009).

This model adds information about the dynamics of how clusters adapt to changing macro factors and how their underlying institutions impact knowledge creation and resource coordination for adaptation and innovation (See Figure 3-1). I describe this broadened set of dynamics as *adaptive efficiency,* a term first used by North (1991; 1993, 1998) in institutional economics, and mentioned in planning by Moroni (2010). I have intentionally borrowed a term from evolutionary theory (adaptation) and socio-ecological systems research because a complex adaptive systems perspective, combined with the term's history in economics (North 1991, 1993, 1998), better fits within the complex systems frameworks that describe local industries in the age of global economic networks. The GVC perspective on resilience highlights the need to produce for an ever-changing global marketplace providing a context for the importance of innovation and knowledge, as well as institutions that can foster dynamic change within a resilience framework, but also exert power over the location and structure of production.

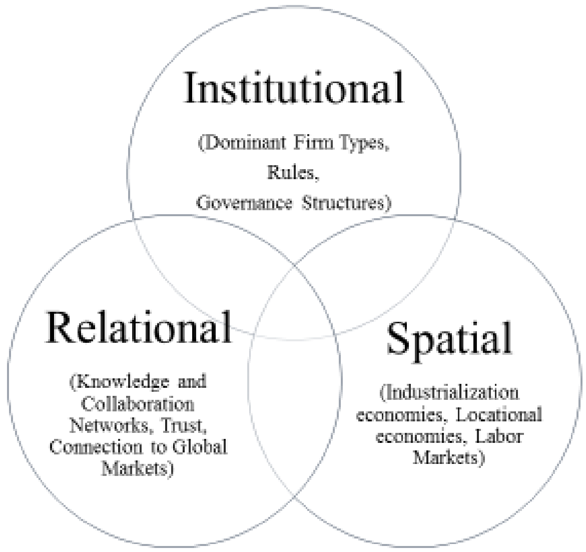

Figure 3-2 Elements of Adaptive Efficiency Framework

This section provides context and key questions for the core terms in my *adaptive efficiency* model as they relate to the resilience of local coffee clusters.

3.2 Resilience in Global Value Chains

While all of these factors inter-relate, it is easiest to describe separately each factor's specific rationale together with the predictions that I will test related to these rationales.[13] In the model, local variation in industrial organization, which I describe as "cluster factors", create different adaptive efficiencies (or inefficiencies), within GVCs. However, the model also highlights agent-based capacities for adaptation and persistence, which I focus on in this dissertation because of the frame of resilience. I argue that variations in institutional conventions, relational (in the form of knowledge and collaboration networks)

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[13] The interrelationship of the factors will not be considered in the formal predictions section. There is a dearth of information about how these factors interact in coffee systems, and building a literature to support postulating about their interactions would make the project impossibly complicated, but this is an important component of the model's coherence which will be qualitatively explored in the case study section.

structure, and spatial agglomeration of industry are all important factors in a cluster's resilience within GVCs.

Specifically,

1. In terms of Institutional Factors, I examine how firm ownership and production structure, culture, land tenure, and lead firm governance impact how clusters relate to GVCs (See Figure 3-2)

2. In terms of Relational Factors, I measure the strength (including trust) and openness of local (or cluster) networks within the Global Value Chain, and

3. In terms of Spatial Factors, I examine industry concentration and localization economies;

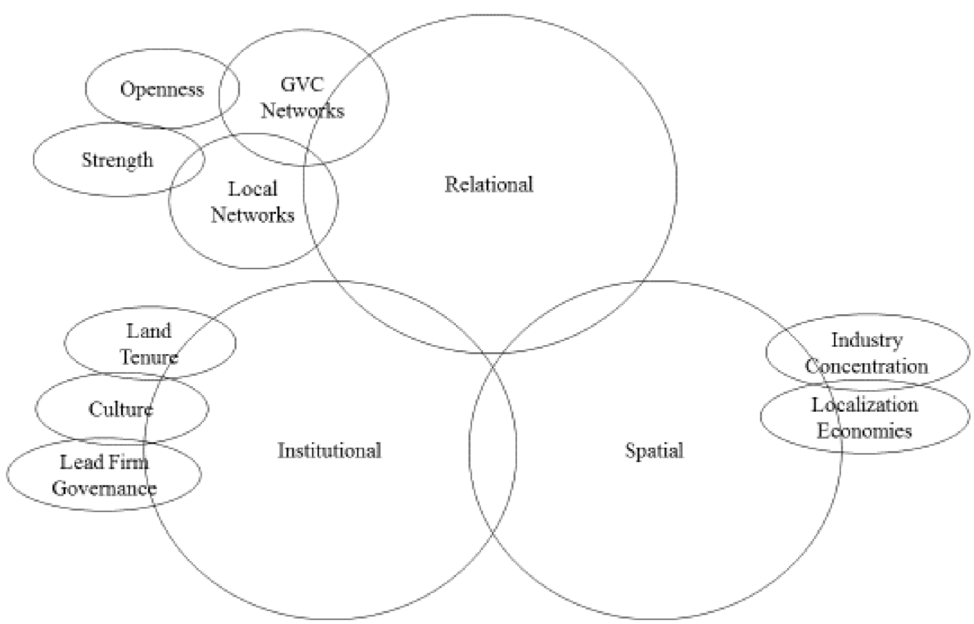

Figure 3-3 Model Elements and Measures

3.3 Model Element 1: Institutional Factors

Institutions impact "patterns of interconnections" and interactions among actors and thus play key structuring roles in developing or hindering local productive systems, organizational change, and learning (Perez-Aleman 2012, 656). In the coffee agriculture systems studied here, there are three local institutional configurations that are of primary importance and show strong variation from one region to another: 1) the ownership and operational structure of local mills, also known as beneficios, 2) variations in culture, and 3) patterns of land tenure. I select six of my cases on the first variation, and the last two on the second. Land tenure is a background element, which differs markedly between Mexico and Costa Rica.

3.3.1 Ownership and Operational Structure of Mills

Coffee processing mills function as central nodes in governing flows of power and knowledge from the GVC and as catalysts of learning and collaboration at the cluster level. Their organization creates an institutional structure for the local industry. They are key actors, coordinating collaboration and interaction among groups and individuals in the cluster. They can act as intermediaries for collective action, mutual support, "localized learning capabilities," and in developing economies "learning and monitoring", which allows for catching up in terms of production techniques and organizational knowledge (Perez-Aleman 2005, 652 & 657).

3.3.1.1 Ownership and Operational Structure Predictions

Hypothesis 1: Clusters with strong cooperatives will be relatively more resilient

Hypothesis 2: Cluster resilience will correspond to areas whose institutions encourage value chain upgrading

3.3.2 Land Tenure

Different forms of tenure promote structurally different social and economic relationships within agricultural clusters, and thus influence resilience by impacting the options farmers have regarding the long-term use and disposition of the land upon which coffee is grown. More communal forms of land tenure create stable land uses, lead to greater bonding social capital, and anchor a community within an agricultural industry. Collective action may be enabled through community governance and the limits on alienation that exist in many common property systems (Ostrom & Hess 2007), such as ejido and indigenous land tenure in Mexico (Barnes 2009). However, private property rights over land may lead to greater bridging social capital and access to capital (if actors are able to collateralize their land) (De Soto 2000). Private landowners may have more incentive and capacity to seek outside knowledge and resources in the coffee value chain. This will be especially true when there are not institutional mechanisms to support farmers on communal land systems within modern competitive value chains.

3.3.2.1 Land Tenure Predictions

Hypothesis 3 Communal land tenure will lead to lower levels of on-farm investment and upgrading in the absence of strong public mechanisms to support farmers. These differences will primarily manifest themselves at the national level.

3.3.3 Culture and Language

Culture can affect coffee clusters at different scales. First, the importance of coffee in the national economy and identity may be important for promoting persistence and commitment to the industry, leading to adaptations. Second, cultural distance and language barriers may make the formation of trust-based relationships and information sharing difficult among value-chain actors, whereas, common culture may promote trust-based relationships. To the extent that national value chain actors do not share a common language, or a common cultural identity with farmers in a cluster, additional transaction costs in the construction of key relationships and collaboration may exist.[14] This will be a disadvantage for historically marginalized groups that are minority cultures within a larger cultural context, with which there is a history of exploitation. This is not a normative judgment about culture, but a lens of analysis for understanding institutional factors which might affect how communities interact with global value chains.

3.3.3.1 Culture and Language Predictions

Hypothesis 4: Clusters where producers are primarily from historically marginalized indigenous cultures will have weaker networks with external actors within public institutions and the coffee value chain. These barriers will affect resilience.

3.4 Model Element 2: Relational Factors

Local knowledge creation and information sharing is central to local industry innovation within GVCs, occurring through reciprocal relational networks among producers. The performance of these networks depends on the strength and efficacy of interactions among

[14] This prediction does not suggest in any way that cultures are inherently more or less capable of being economically productive or resilient, rather that it can change the relationship with the value chain.

local actors and the openness of the local cluster to interact with outside actors. Openness to external networks is central for innovation and adaptation, because of the need to channel information from market centers to agricultural clusters. However, strong local networks are important for collective action and collaboration, which affect the ability of the cluster to coordinate its actors into a cohesive group of producers that pool resources and seek common goals. In particular, trust in lead firms, and governance bodies are crucial for intermediating knowledge development.

3.4.1 Relational Factors Predictions

Hypothesis 5: Cluster resilience will correspond to stronger social networks and social capital within the cluster (akin to bonding capital).

1. More cohesive collaboration and knowledge networks.

2. Locally anchored institutions (especially cooperatives) as both gatekeepers of knowledge and policy advocates

3. More trust and collaboration around key resilience topics among local firms

Hypothesis 6: More resilient clusters will have more open knowledge and collaboration networks (akin to bridging capital).

4. More and stronger links to external actors in the coffee GVC

5. More collaboration and trust with publicly oriented institutions (e.g. Government, Educational, and NGOs)

Hypothesis 7: Larger national patterns of social capital influence cluster resilience

3.5 Model Element 3: Spatial Agglomeration Factors

Contained within the concept of adaptive efficiency is the notion that the number and density of local actors, the efficiency of interactions among them, and their shared infrastructure are crucial elements of long-term success in local agricultural economies. These create agglomeration economies in transportation and labour, and external knowledge economies, which have been shown to encourage innovation in non-agricultural industries, and in some case studies of agriculture in the Global South (Garrett 2013, Perez-Aleman 2005).

3.5.1 Spatial Agglomeration Predictions

Hypothesis 8: Resilient areas will have better access to labour pools and transportation networks.

Hypothesis 9: Resilient areas will benefit from the industrialization economies provided by greater concentration of industry infrastructure and intermediary organizations.

CHAPTER 4. MIXED METHODS RESEARCH DESIGN

This dissertation is organized around a triangulated mixed methods approach, where much of the quantitative data and qualitative data were collected concurrently (Creswell 2003, 63). The methods employed in this project, as described below (see Table 3 Relationship of Methods to Adaptive Efficiency Model), reflect the need to use diverse approaches to measure the different model factors, the research around each of which largely developed in different domains of the social sciences. Moreover, the triangulated convergence approach used here attempts to create a methodological assessment that recognizes the multifaceted concept of local industry resilience.

Resilience, as presented in this dissertation, is not a single outcome, as a single response variable risks being reductionist within a larger evaluation of industry adaptation. Structurally, this dissertation contains a mixed method, embedded, comparative case study (Yin 2013), where I study adaptation for resilience within Global Value Chains (GVCs) in four comparative cases in two different countries (Costa Rica and Mexico), eight cases in total. The case studies include a qualitative component based on interview and secondary data sources, and an analytical component based on social network analysis. Additionally, I include a regression model, which includes data from only one country (due to data availability and reliability) to test questions of spatial concentration and land use change which are difficult to identify using the case study design. Accordingly, there are three principal methods used to test the adaptive efficiency model (See Figure 4.1 Relationship of Methods to Adaptive Efficiency Model).

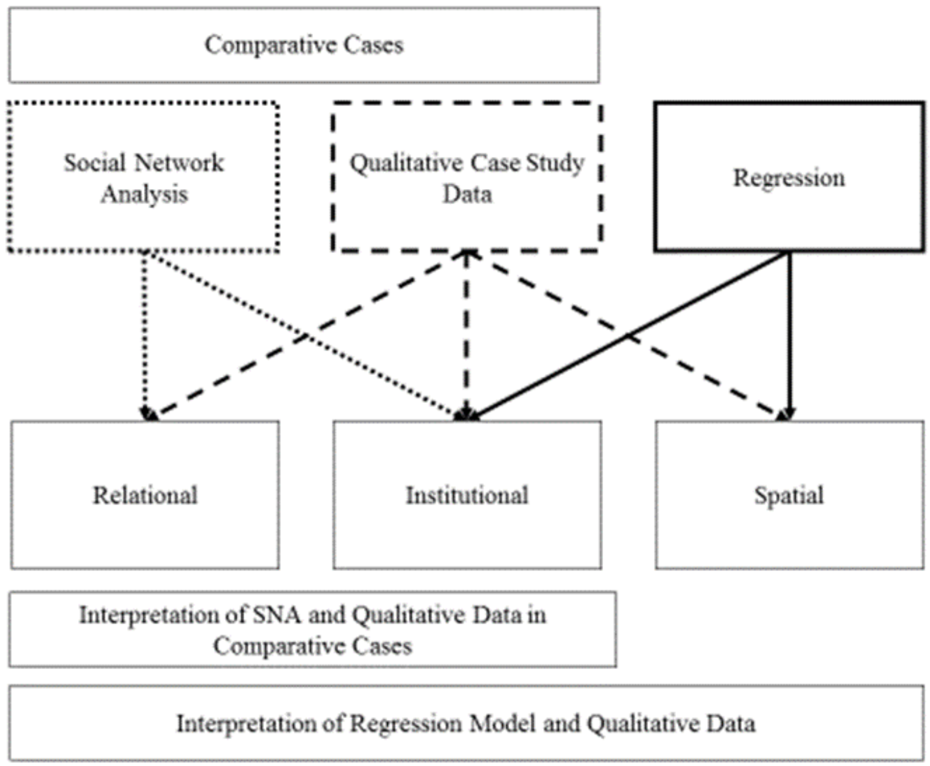

Figure 4-1 Relationship of Methods to Adaptive Efficiency Model

The use of mixed methods interpretation is both a function of the diverse components of the adaptive efficiency model, and also of different data availabilities in the two countries and eight individual cases. Only through triangulation of data from diverse sources, which I analyze in a convergent mixed methods approach (Creswell and Plano 2011), could I make reliable conclusions about the diverse territories and phenomena addressed in this project. Each method I employ is organized around a central question, related to the model, and through which I address specific questions regarding the model (Table 4-1 Summary of questions related to each of the model elements and analytical measures.Table 4-1).

Table 4-1 Summary of questions related to each of the model elements and analytical measures.

Chapter	Question	Institutional	Relational	Spatial	Resilience Indicators	Method	Study Unit
Social Network Analysis	How does institutional variation influence relational factors and in turn resilience?	Coops vs Non-Coops Mestizo vs Indigenous Culture	Group Cohesion, Actor Centrality	n/a	Production Trends	Social Network Analysis, Comparative Cases	Regional Comparative Cases (N=8); Nation-Wide Comparative Cases (N=2)
			Collaboration		Land Use Change		
			Trust				
Qualitative Case Studies	How do components of the Adaptive Efficiency Model relate to adaptation?	Coops vs Non-Coops	Collaboration	Presence of Suppliers	Adaptation Strategies	Semi-structured Interviews, Qualitative Comparative Case Studies	Regional Comparative Cases (N=6)
		Mestizo vs Indigenous Culture	Trust	Distance to Services	Production Trends		Regional Comparative Cases (N=2)
		Private vs Collective Land Tenure			Land Use Change		Nation-wide Comparative Cases (N=2)
Regression Model	How do agglomeration factors and cooperatives affect resilience?	Percent Cooperatives	n/a	Distance to Collection Points	Land Use Change	Regression Analysis	Costa Rica Coffee Producing Districts (N=161)
				Rural Population			
				Number of Mills			

In order to frame my exploration of these questions, I start (in Chapter 6) with a series of quantitative outcomes regarding resilience in my cases. These serve as a baseline for comparing outcomes among the cases. These comparisons provide some initial idea of how the cases performed in terms of resilience during and after the coffee crisis. They also frame the exploration of the model in terms of its ability to explain differences between the pairs of cases.

4.1 Comparative Case Study Approach

Following Yin's (2014, 51) framework, this project uses a multiple case study format (Figure 4-2), comparing the Mexico and Costa Rica coffee clusters described below. This methodology allows for replication within coffee clusters and cross-case comparison, such that a single anomalous case does not lead to misleading conclusions. As Yin notes, employing a cross case selection method, allows for hypothesis testing. Here, the case studies should illuminate how the composition of social networks and institutional organization leads to diverse levels of adaptive efficiency, and thus resilience in coffee clusters.

Here the larger context is the coffee industry in Costa Rica and Mexico, but the cases under analysis are local coffee clusters and intermediaries as embedded units of analysis within the national cluster. Each cluster case is selected to shed light on conditions around collective action and network configuration, including the strength of local network ties and network openness (Eisengerich et al 2013). Focusing on intermediaries as embedded units of analysis within the cluster allows a point of reference for comparing collaborative and network structures.

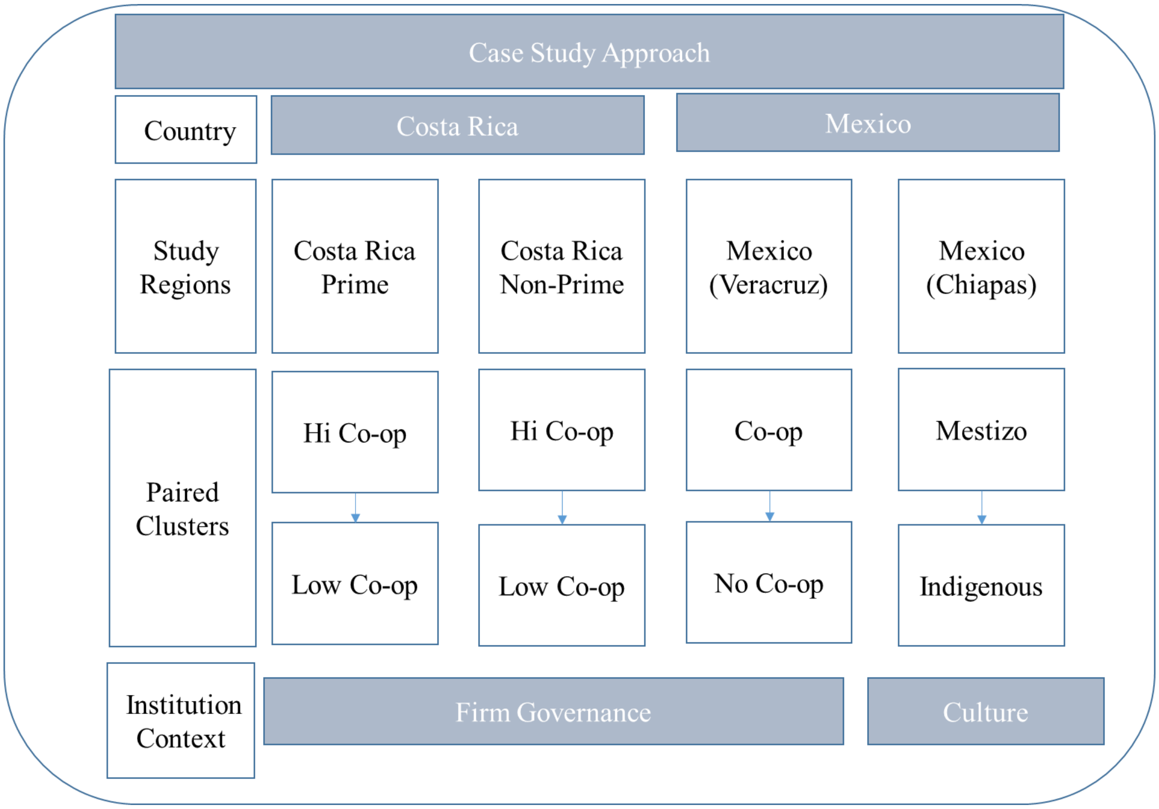

Figure 4-2 Comparative Case Study Approach

In terms of selection, all pairings were selected on institutional variations. They test the role of the adaptive efficiency model within contexts that vary primarily on the structure of their cluster governance. Three of the pairings compare territories where cooperatives play a central role in the cluster with similar areas where cooperatives are not lead firms. A fourth pairing compares two areas of Chiapas, a state in southern Mexico, both of which have a history of cooperatives, but in one of which the dominant culture of producers is Spanish-speaking mestizo,[15] and another in which the dominant culture of producers is Maya (Tzeltal or Tzotzil-speaking) (Castillo et al 1998, Martinez 2007). All the cases control for macro and environmental factors impacting resilience, such as the quality of the

[15] By this I mean that most the producers primarily identify as Spanish speaking Mexican.

region's biophysical characteristics for producing profitable coffee volumes and cup profile.

Data for these case studies was collected from semi-structured interviews, social network surveys, and secondary data sources. One set of interviews, those with coffee milling and processing organizations, included a series of questions about collaboration and economic and environmental adaptation, as well as a social network analysis survey. A second set of interviews was with key informants, either in coffee governance institutions, or otherwise positioned in important places for the industry. Detail of this approach can be found in the methodology sections of Chapters 7 and 8. Table 4.2 describes the total number of interviews I conducted for this project. In subsequent sections, the numbers reported may vary, because in some cases I interviewed multiple members of a single organization, and when executing the survey, I prioritized completion of the social network analysis section. Furthermore, many of my interviews were in agro-industrial settings, on tight-time frames, and with participants whom I had never met before. As such, I was unable to record all interviews, as I had originally planned, because of technological limitations surrounding sound quality, and the need to create trust with the interviewees.

Table 4-2 Number of Interviews Conducted by Cluster and Country

Country	Background Interviews	Interviews with Hub/Export Offices	Case	Interviews with Mills in Cluster
Costa Rica	National 10 (4), Prime Cases 6 (3), Non-Prime Cases 5 (3)	2 (2)	Prime High Coop	28 (23)
			Prime Low Coop	16 (12)
			Non-Prime High Coop	17 (11)
			Non-Prime Low Coop	12 (9)
Mexico	National 3 (-), Veracruz 11 (4), Chiapas 16 (4)	7 (4)	Veracruz High Coop	17 (7)
			Veracruz Low Coop	14 (8)
			Chiapas Mestizo	16 (5)
			Chiapas Indigenous	14 (9)

*Brackets () denote interviews that I recorded and transcribed in part or in full.

4.2 Social Network Analysis

One way to test whether clusters differ in terms of the way actors in them interact is by measuring, analyzing, and comparing social networks to understand the specific nature of relational structures in the network and the roles of different actors (Naiphet and Goshal 1998, Burt 2000, Uzzi 1999). To validate my propositions about relational impacts and resilience, my method includes a social network analysis (SNA) of local mills in each of my selected clusters. SNA provides context for understanding the organization and structure of knowledge and collaboration. SNA also provides comparative information about the ego networks of key actors in each cluster, identifies the central actors for cluster-based planning and policy, and provides a concrete measure for concepts such as social capital.

Such quantitative social network analysis of micro-level data is now an established method of analyzing learning and collaboration networks in clusters (Giuliani 2013), a method that has recently been applied to explaining the resilience of local economic clusters (Crespo et al 2014). Social network analysis can also focus on organizations (Carpenter and Li 2012) to measure how their networks at cluster level and with outside actors differ among classes of institutional actors. I focus on how the structure of the local network varies in different institutional settings. This provides an important insight into the relationship between social capital and lead firms, as well as how institutional variation may influence network openness and cohesion.

These methods primarily address Hypotheses 5, 6, and 7, listed below in Table 4.3. Broadly, the social network section uses three approaches. The first is to examine the cohesion and strength of the local knowledge and collaboration network of mills in each cluster to see how inclusive they are locally, and if this corresponds to my intuitional case selection criteria and resilience. However, examining only local firms excludes important first contact points to the GVC for coffee, which are the administrative offices of vertically integrated firms, which operate through a hub and spoke model. Because these firms are dominant exporters, they may play an important role in knowledge development and adaptation support for other industry firms, but they tend to be less embedded in local networks (Giuliani and Bell 2005). Accordingly, I measure the networks of the 8 clusters in this study with these hubs and without them, both to better understand their role, and also to understand if resilient clusters are more or less organized around these firms versus locally embedded firms, especially cooperatives. These analyses address Hypothesis 6 (see Table 4.3). The relationship with the hub offices of the vertically integrated exporters is of particular interest in the Chiapas cases, where I predict in Hypothesis 4, that there will be significant friction between indigenous communities and traditional value chain actors. I further answer questions regarding the role of locally embedded actors through analysis of network centrality and aggregation of different types of mills by their ownership and operational structure.

To address questions of network strength and trust, Hypotheses 5, 6 & 7 (see Table 4.3), I asked every interviewee to describe the strength of their relationship with the contacts that they reported by rating the frequency of communication and trust on 5 point scales. To compare how network strength varies among clusters, and between Costa Rica and Mexico, I average the scores from each mill by institution type and use Mann-Whitney tests to compare if there are significant differences. This allows me to both analyze general patterns of trust, and to measure Hypothesis 6, regarding variations in patterns of contacts with publically oriented actors.

Finally, to understand if more resilient clusters collaborate more around issues of collective governance (Visser and de Langen 2006) and H6(6), I asked a series of questions regarding how respondents evaluated collaboration around common infrastructure, cluster development, innovation, and environmental issues. I analyze these responses by comparing pairings, and Costa Rica and Mexico with Mann-Whitney tests.

4.3 Qualitative Case Studies

One limitation of the social network approach in this study is that it relies on a cross-sectional snapshot based on reported relationships in 2012-2014. Resilience, as a concept, is inherently dynamic, and while this data may prove very useful in terms of comparing the structure of local industries and governance, or the components of the adaptive efficiency model, it is less useful in understanding change over time. For this reason, questions regarding social capital and resilience are often studied through comparative case studies (Putnam 2005, Adger 2000, Pelling et al 2005, Christopherson and Clark 2007, Clark 2013) and qualitative case studies (e.g. Uzzi 1997, Saxenian 1991, Saxenian 1996, Eisengerich et al 2010).

These same case studies can help answer propositions about social networks, institutional factors, and agglomeration factors. Case studies of local industrial performance often focus on the interaction among localization economies, competitiveness, and innovation (Giuliani 2007, Garret et al 2013, Markusen 1996, Gordon and McCann 2000, Porter 1996) and studies of local institutions are often presented in the form of case studies (e.g., Perez-Aleman 2005). In the case of connections to global markets, an evaluative approach is achieved by triangulating flows of coffee from producers to global actors (Carranza et al 2012) with questions of local strategies to adapt in the global marketplace (e.g., Perez-Aleman 2005, Aleward & Turpin 2003).

I use the qualitative case studies to describe how the elements of the model interacted and influenced divergent trajectories of adaptation. Using qualitative data from interviews and secondary sources, allows me to understand how different elements of the model interacted, such as the interplay between institutions and social networks. More importantly, the interview data provides the perspective of the actors who comprise the local cluster, and their perspective on issues, such as collaboration, adaptation, and resilience.

This chapter analyzes the qualitative data from the perspective of how the components of the Adaptive Efficiency Model relate to adaptation and resilience. In the context of the quantitative resilience outcomes, I analyze results from my qualitative interview data from each case considering each component of the adaptive efficiency model, and relate these to my overall hypotheses. For the institutional component, I analyze interview data for themes of institutional adaptation, different roles played by key groups of actors, how different firm structured impacted the functioning of lead firms in clusters, and the creation of new institutions as an adaptive strategy. For the relational component, I identify themes of trust and collaboration in the cluster pairings and relate these to adaptation and the roles played by mills and public entities. While the spatial component is potentially the hardest to address through qualitative methods, I describe the geography of industry activity in the cluster and its relationship with spatial phenomena. As with the other methods, I include a more detailed explanation of the comparative case methods in Chapter 8.

4.4 Regression & Land Use Change

My last method of analysis is a regression model to test the effect of agglomeration factors and institutional factors on resilience. It is largely confirmatory of the case study data. The model measures the relative resilience of coffee clusters by looking at two factors: (1) long-term land use change documented using GIS tools for coffee in Costa Rica over a 12-year period from 2001 to 2012 and (2) variations in local production volumes documented by publicly available data from ICAFE (Costa Rica). I do not include a model for Mexico because of challenges with data reliability and availability that became apparent to me after I became involved with the data.

The regression model provides an overall measure of trends in coffee production and how they relate to factors within the adaptive efficiency framework. For example, studies of long term industrial performance (Glaeser 2004, Acemoglu 2008) use regression models based on local characteristics (E.g., Blackman et al 2012, Rueda and Lambin 2013). The regression approach is particularly appropriate for testing propositions related to agglomeration economies (Horbeck and Keskin 2012, Ellison et al 2010, Rueda & Lambin 2013). The model also tests the effect of institutional variables, such as the percentage of coffee sold to cooperatives, as has been done in several previous studies (e.g., Blackman et al 2008, Rueda and Lambin 2013a). This approach rests on a long line of economic and natural resources based research on land use change in tropical agricultural systems, although it most directly takes inspiration from Rueda and Lambin (2013a). This model tests the statistical validity of Hypothesis 1, and Hypotheses 8 and 9. A detailed methodology for this approach is included in Chapter 9.

4.5 Convergent Analysis

After reporting results for the qualitative and social network sections, I interpret the findings in a convergent discussion section (Chapter 10). The purpose of this section is to discuss outcomes in each of the cases considering each of the model elements, as documented both through the qualitative and network data. In this section, I examine how the network and qualitative data analyzed in the previous sections correspond to the hypotheses (See Table 4.3) and relate to the adaptive efficiency model.

Table 4-3 Hypotheses Addressed by Model Elements and Approach

Hypotheses by AE Model Elements		*Measures by Approach*		
		Social Network Analysis	**Case Studies**	**Regressions**
Institutional	**H1:** Clusters with strong cooperatives will be relatively more resilient	Cohesion and Centrality Measures	Documentation and comparison of role of local mills in adaptation through qualitative interview data and secondary sources	Percentage of Coffee Sold in a District that is Sold to Cooperatives
	H2: Cluster resilience will correspond to areas whose institutions encourage value chain upgrading	n/a	Documentation and comparison of innovation through qualitative interview data and secondary sources	n/a
	H3: Communal land tenure will lead to lower levels of on-farm investment and upgrading in the absence of strong public mechanisms to support farmers. These differences will primarily manifest themselves at the national level.	n/a	Comparison of Mexico and Costa Rica Outcomes	n/a
	H4: Clusters where producers are primarily from historically marginalized indigenous cultures will have weaker networks with external actors within public institutions and the coffee value chain . These barriers will affect resilience.	n/a	Quantitative comparison of outcomes, Qualitative interview and secondary data and comparison with Chiapas cases	n/a
Relational	**H5:** Cluster resilience will correspond to stronger social networks and social capital within the cluster (akin to bonding capital).	-	Quantitative comparison of outcomes, Qualitative interview and secondary data and comparison	n/a

	1. More cohesive collaboration and knowledge networks.	Cohesion Measures	-	n/a
	2. Locally anchored institutions (especially cooperatives) as both gatekeepers of knowledge and policy advocates	Centrality Measures	-	n/a
	3. More trust and collaboration around key resilience topics among local firms	Network Strength Measures & Cluster Governance Questions	-	n/a
	H6: More resilient clusters will have more open knowledge and collaboration networks (akin to bridging capital).	-	Quantitative comparison of outcomes, Qualitative interview and secondary data and comparison	-
	1. More and stronger links to external actors in the coffee GVC	Comparison of Links by Institution Type and Hubs	-	n/a
	2. More collaboration and trust with publically oriented institutions (e.g. Government, Educational, and NGOs)	Cluster Governance Questions	-	n/a
	H7: Social capital within an industry is driven by both local variation, and national institutional context	National Level Comparisons of Cluster Governance and Network Strength Measures	Qualitative interview and secondary data and comparison	n/a
Agglomeration	**H8:** Resilient areas will have better access to labor pools and transportation networks.	n/a	n/a	Distance Measures to Collection Points & Rural Population
	H9: Resilient areas will benefit from the industrialization economies provided by greater concentration of industry infrastructure and intermediary organizations.	n/a	Qualitative interview and secondary data and comparison	Number of Mills Purchasing in District

4.6 Costa Rica and Mexico Comparisons: Enabling Environments

4.6.1 Place of Coffee in National Economy

Like other agricultural goods, coffee is organized into super-clusters either at the national level, in small countries such as Costa Rica, or at the state level in larger countries, such as Mexico or Brazil. Within super-clusters in the agricultural industry (e.g., the California Wine Cluster (Porter 2000)), clusters have been shown to be essential to long-term competitiveness and differences in regional performance (Giuliani 2005, 2013). Because this study is primarily directed at understanding what can be done to promote resilient regions and localities, I focus primarily on the performance of clusters at the local level, rather than national or state level performance, yet it is essential to understand the difference in the two national contexts.

I use a bi-national framework because, while local institutional variation may matter, clusters are bounded and shaped by the social and national context in which they operate. I selected cases in two countries to begin to understand the extent to which national cultural and political aspects may weigh prominently in industry performance. This information helps inform the role of collective and joint action on local industry, following Nadvi and Schmitz (1999), identifying what capabilities and resources need to be developed collectively through "cluster governance" (De Langen and Visser 2005, Visser and De Langen 2006), and at which scale these issues are best addressed.

I test the propositions in my model by comparing the recovery and adaptation of the cases from the international coffee price trough of 2002. This decade long period represents the lowest moment of the "coffee crisis" in Central America, which was caused by the deregulation of markets in the early 1990s and the entry of new growing regions during the same decade. There are two other relevant aspects of this time period that make it useful for studying adaptation and resilience. The first is the strong growth of specialty coffees following the trough in 2002, which can be seen through new market institutions, such as the Specialty Coffee Association of America and the Cup of Excellence. The second is the entry of environmental and social concerns into the coffee value chain through the emergence of sustainability certifications. What these trends suggest is that stress on the industry from instability in commodity coffee prices pushed farmers to seek new sources of value through ever greater product differentiation and geographic premiums within the international marketplace (Rueda and Lambin 2013).

A secondary event, is the environmental shock presented by the recent Roya crisis, which presented an immediate scenario for understanding governance capacity to respond to an environmental crisis. This event occurred during the execution of this project, and thus presented an opportunity to study in real time governance capacity for resilience.

4.6.2 Country Comparisons

Costa Rica and Mexico are both lower middle-income countries in terms of per capita GDP and many social indicators, but they differ in their size, and in the role that coffee plays in the larger economy (Parizat et al 2015). While Mexico's population is nearing 120,000,000, Costa Rica's is approximately 4,000,000. Mexico started industrializing much earlier than Costa Rica, with the result that agriculture has been on a second plane within the Mexican economy since the 1990s (Figure 4-3), and coffee, which is grown mostly in the mountainous regions of Southern Mexico, has never been a national product, even though hundreds of thousands of rural Mexican families depend on coffee for basic income. In Costa Rica, coffee was a significant part of the Costa Rican nation building project (Williams 1994) and a leading component of national exports (Renjivo 1989) in the 1990's. Costa Rica too has industrialized, but coffee remains a core part of the national identity. In this sense, comparing Costa Rica and Mexico serves as a comparison of how regional resilience in the coffee industry differs in countries where coffee is peripheral and where it is central to the national project.

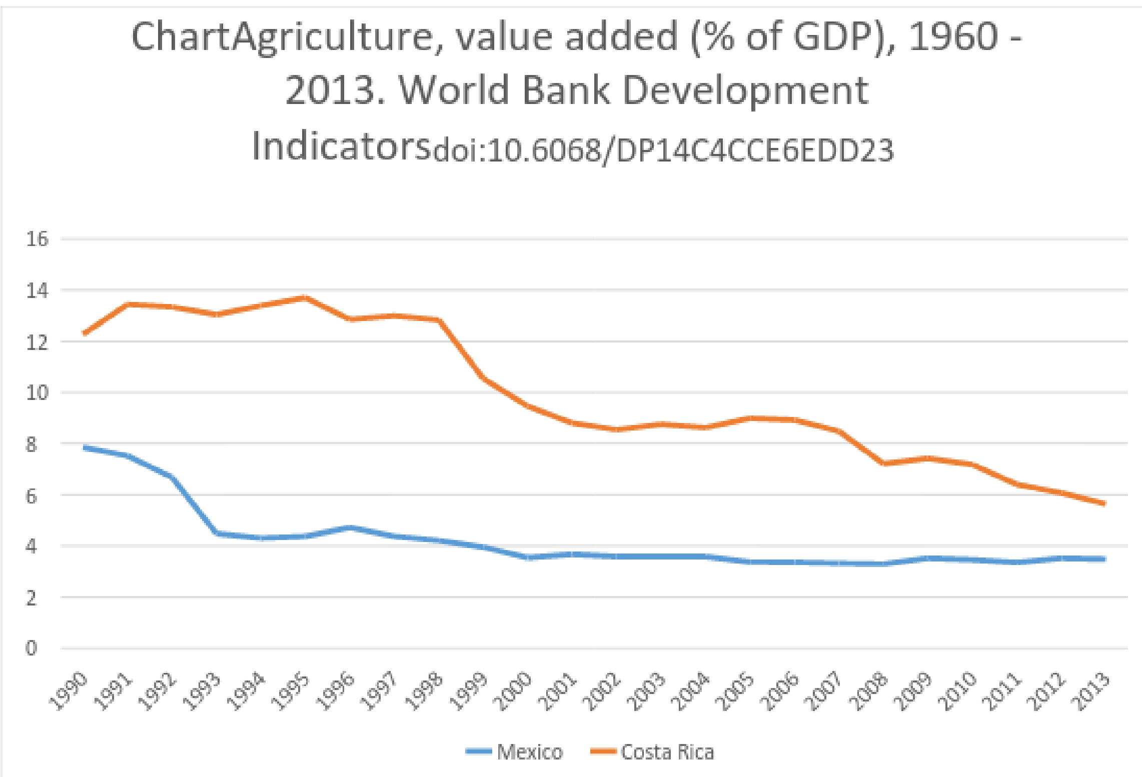

Figure 4-3Agriculture as Percentage of GDP in Costa Rica and Mexico 1990-2013

Another important difference between the two countries is the level of rural poverty (see Figure 4-4). Mexico has strong social contrasts, whereas Costa Rica is a relatively homogenous society. Over 5% of Mexicans speak an indigenous language, and levels of rural poverty and social exclusion are high (see Figure 5.2), which has led to social conflict over the last 30 years, famously through the Zapatista uprising, but also through many other rural conflicts in other states of southern Mexico, including Veracruz. Many of these conflicts have taken place in coffee-producing areas organized around semi-communal, semi-subsistence modes of production.

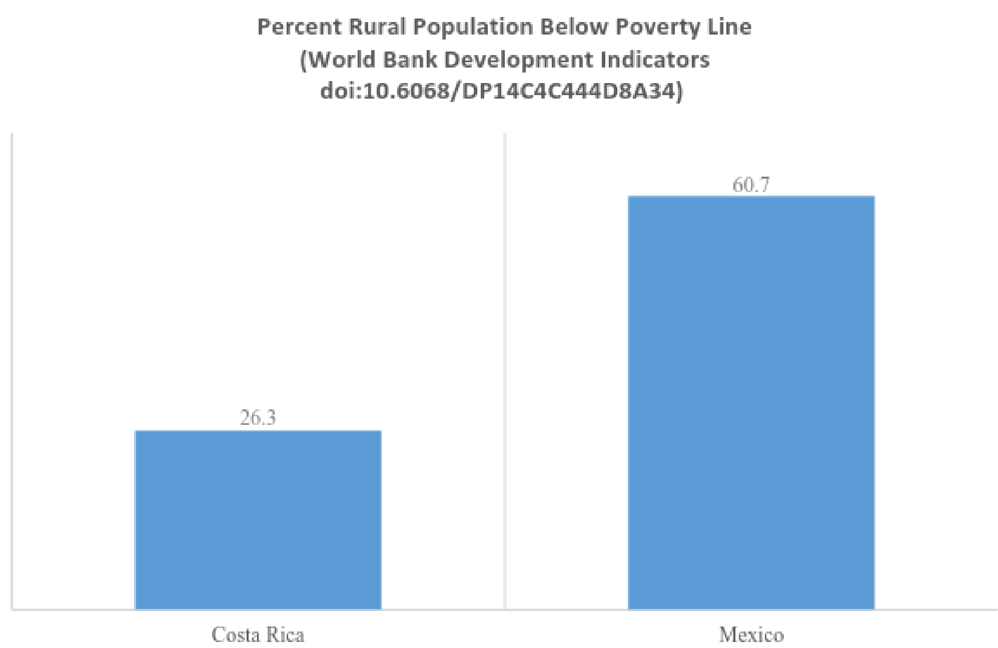

Figure 4-4 Comparison of Rural Poverty in Mexico and Costa Rica (Percentage)

In contrast, Costa Rica has had very little rural conflict since a civil war in the late 1940s, after which the military was abolished, and the government undertook a series of social programs to expand access to education and health care. This, combined with fewer baseline social and ethnic inequalities, has led to a rural sector with much less poverty.

4.6.3 Land Tenure in Costa Rica and Mexico

One area where Costa Rica and Mexico vary strongly is in their history of land tenure. This difference has roots that go back to settlement and colonization patterns (Williams 1994), but also reflects differing patterns of land reform within the 20th Century. Costa Rica largely sponsored a land distribution system to small private holders, often giving them lands in unpopulated mountainous areas, whereas Mexico broke up large land holdings and constructed a system of localized communal land governance (Martinez 2007).

Compared to most of its neighbors, Costa Rica had a low population and undeveloped economy during the period of Spanish rule. As a result, Costa Rica did not, for the most part, develop a "hacienda" economy or the accompanying hierarchical social organization, as was the case in Mexico and many other Central American countries (Williams 1994). The four largest cities of Costa Rica (Alajuela, Cartago, Heredia, and San Jose) all developed in the 19th Century around a coffee industry characterized by many smaller holders, together with some elite, often German or Dutch families, with larger land holdings. In the 20th Century the Costa Rican government promoted settlement of rural areas as a means of national development, and also to provide land to small holder farmers, frequently on the agricultural frontier (Williams 1994). As a result, Costa Rica developed under a system with much more egalitarian free-hold land tenure, and never underwent a large-scale process of post-revolutionary land redistribution as occurred in Mexico and many neighboring countries during the 20th Century. Costa Rican producers do use family labor, but are dedicated to coffee as a primary cash crop, and use farming as a mercantile enterprise rather than an integrated livelihood system.

Mexico has a long tradition of social property, in the form of *ejidos*[16] and indigenous lands. Rural life in Mexico during the 20th century was marked by the federal government's break up of large rural land holdings into an *ejido* system after the Mexican Revolution. This led to the creation of nearly 300,000 *ejidos* by 1990 (de Janvry 2012, Assies 2008), but these have been gradually eroded since the1990s by federal legislative and constitutional changes that privatized communally owned lands (FRBSF 1992, Núñez Rodríguez et al 2013). Besides *ejido*s there are a comparable number of communally owned "agrarian communities" (*comunidades agrarias*), primarily in indigenous areas, many of which formed or were legally recognized in the 1980s and 1990s after land conflicts (Bonilla-Moheno et al 2013). In part these communal land systems constitute semi-subsistence societies, with localized social identities, *patria chicas*, based on close family networks, and geographical isolation.

The fact that commonly held lands were not easily transferred led to a system where the children of successive generations split family apportionments into smaller and smaller plots. Institutional coffee actors often describe this land tenure result as "pulverized." In Mexico, less than 3% of coffee producers farm more than five hectares, and nearly two thirds have less than a single hectare of coffee in production (AMECAFE 2012). Farmers from these groups are referred to as the "social sector" in the coffee chain (Jaffe 2007, 61,

[16] Ejidos were created by breaking up large land holdings after the Mexican Revolution from the 1920s to the 1970s, and dividing them into community lands, with family apportionments. These lands are farmed communally under state supported programs.

Interviews).[17] It is this group of producers that largely constitute cooperative membership, although nationally only a minority of social sector farmers is part of a cooperative.

In this study I focus on two states of Mexico, Chiapas, and Veracruz. The rural areas of these states have high levels of *ejidos,* communally-owned property. Land reform happened earlier in Veracruz in the 1930s-1970s, but the same pressures from landless rural workers in Chiapas led to social conflict with indigenous and organized rural communities during the 1990s. Many of these communities are now engaged in coffee farming on once privately owned lands. However, even within Chiapas, land tenure varies greatly, with coffee production in some regions based primarily around indigenous holdings, others in *ejido* patterns, and others organized around large private farms.

Here I include a government (INEGI) map of *ejido* and indigenous areas of Chiapas (Figure 4-5, I could not locate a similar map for Veracruz) to indicate the extent to which communal property dominates the rural landscape in Mexico.

[17] The social sector refers to small holder agriculture, mostly organized around ejidos and agrarian communities.

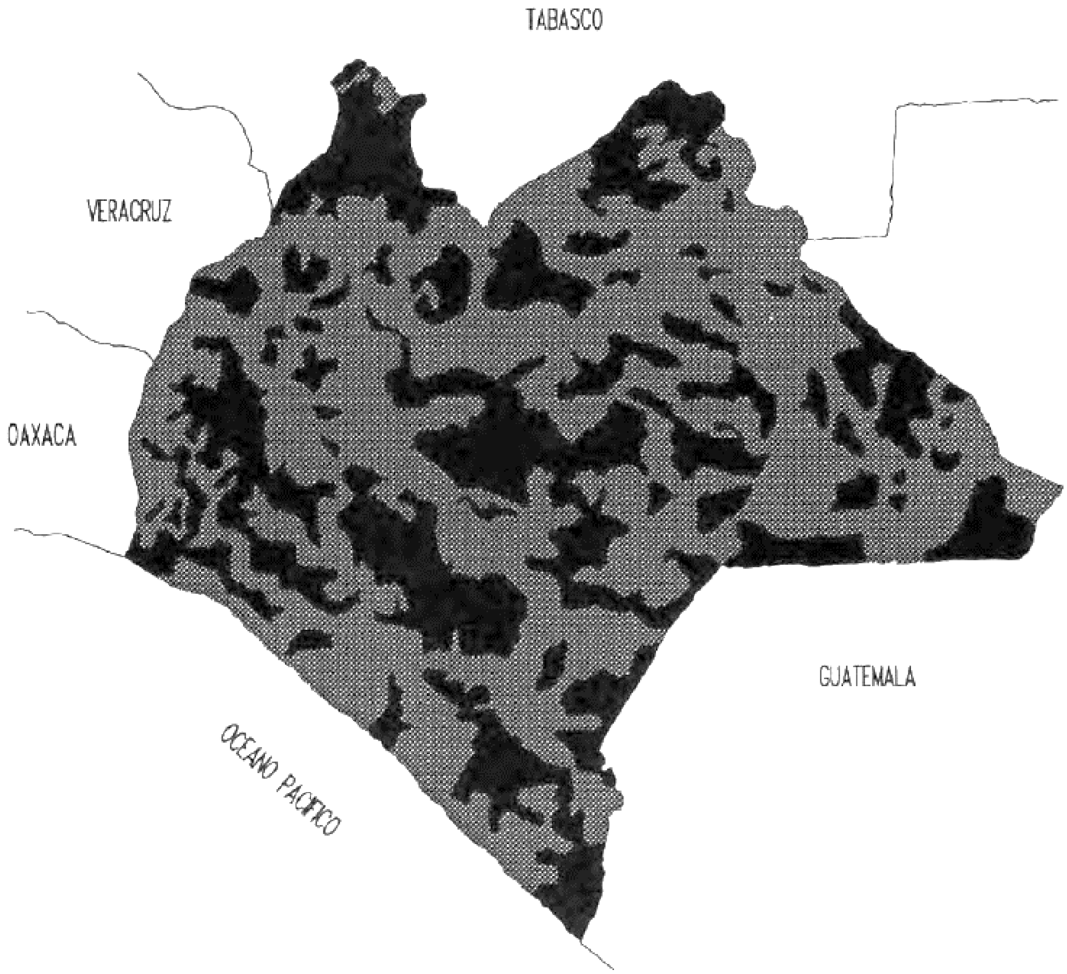

Figure 4-5 Communal land tenure in Chiapas, MX (Ejido and indigenous communal lands in black)(INEGI/SAGARPA, MX)

4.6.4 Coffee Governance in Costa Rica and Mexico

In terms of coffee governance institutions, Mexico and Costa Rica took conceptually similar, but practically divergent paths both before and after the 1990s neoliberal reforms. Starting in the 1960s, Costa Rica established a system that redistributes profits among private actors, which the Costa Rica Coffee Institute (ICAFE) administers, while the Mexican government took redistribution and operation of the coffee commodity chain into its own hands through direct state control of mills (INMECAFE). Then, in the early 1990s, Mexico closed INMECAFE, and severely curtailed extensionism and farmer support at the local level. Around the same time, Costa Rica took ICAFE out of the national government, but provided it with autonomous and consistent funding and created a system where ICAFE would operate regional offices. Both nations removed coffee from state control, but Mexico did so in the context of rapidly tearing down a large socialized extensionist, milling, and export system, while Costa Rica merely reformed its existing structures.

4.6.4.1 Coffee Governance in Costa Rica

Costa Rica began a process in 1948, after a brief civil war, to regulate the relationship among growers, millers, and exporters, creating the Office of Coffee within the Institute for the Defense of Coffee, and dedicating part of the Ministry of Agriculture (MAG) to technical aspects of growing. In 1950 Costa Rica opened a research office for coffee, and started actively promoting extension services through regional offices (ICAFE 2014). Coffee policy followed the market oriented socialism of the victors of the civil war, in that the government sought to promote profit distribution within a market context rather than take full command and control policies. In 1961 Costa Rica enacted the Coffee Producers, Processors and Exporters Law (No. 2762), which did several important things regarding the institutional governance of Costa Rican coffee. First, it created a basis for the support and creation of a formalized cooperative movement, and the establishment of new coffee Cooperatives (Diaz-Porras 2003); second, it created a system of profit distribution to protect farmers that set profit levels for millers and exporters, and finally it created a traceability system linking coffee sales to receiving points and mills. MAG operated ICAFE until 1998 (called the Costa Rican Coffee Office until 1985 when the name changed to ICAFE), when it was turned into an autonomous non-state entity operating with a special allocation of 1.5% of the value of green coffee exports (ICAFE 2014). More importantly Costa Rica collaborated internationally to develop high-input, high yield, coffee varietals, and spread modern farming techniques to small-hold farmers through extension offices. This extensionism, combined with its regulated supply-chain, transferred many of the transaction costs of farming away from farmers with smaller and medium parcels, and led to one of the most productive systems in the world, with yields growing rapidly from the 1960s-1990s.

Law 2762 governs commercial relationships among growers, millers, exporters, and roasters. The purpose of Law 2762 is to create equity among participants at each stage of the process. Growers are guaranteed 72% of the sale price of the exported coffee, which acts as a redistributive policy. ICAFE (CR Coffee Institute) originally was part of the Agricultural Ministry, but now operates as a quasi-public entity governed by a board consisting of representatives from different sectors of the industry. The 1.5% tax on every 100 pound bag of green coffee shipped from the country finances the agency's regulatory operations, and allows it to engage in coffee extension services, agronomy experiments, and to a small extent marketing support.

Coffee production in Costa Rica spread during a period of high global prices from the 1960s-1980s, during which time the industry grew in lower land areas, and yields exploded to the highest in the world thanks to Green Revolution extensionism and support (Samper 2010). Consequently, Costa Rica has strongly technified coffee, with dense plantings of between 4,000-5,000 plants a hectare and high yields. A key element of ICAFE was its farmer education and sponsorship of research into new highly productive varietals, such as catimor, which were developed to be planted using high levels of chemical fertilizer and pesticides, and low levels of shade.

Through Law 2762, Costa Rica has built a strong traceability system into its coffee governance structure. Harvested coffee must be deposited at receiving points in the same region where it is grown, and registered to the region where it is grown. This creates a system where nearly every sale of coffee is registered and linked to a location. There is not traceability for each sack of coffee, because most of the harvest is mixed in large wet mills, but Costa Rica provides one of the world's most transparent coffee commodity chains. Further, as every grower must be registered to sell coffee, ICAFE is able to reach out directly to growers and runs an influential email listserv. This regulatory structure creates a system whereby the vast majority of coffee in Costa Rica is delivered directly to processing mills by farmers. A minority of coffee in Costa Rica is milled by micro mills, or by on-farm mills of larger estates. Regardless, all of these transactions must be registered under Law Number 2762 (Figure 4-6).

In describing the milling configurations in Costa Rica, Sandi-Morales et al (2006) broke them down into cooperatives, mills linked to exporters, and independent mills (mostly estate oriented). However, these traditional groupings have recently changed to (1) independent mills linked to larger estates, (2) micromills linked to direct trade exporters, (3) cooperatives, (4) producers associations, and (5) mills linked to multinational exporters. The emergence of smaller mills had already formed during the mid-2000s (Sandi-Morales et al 2006, Samper 2010), although at that period micro mills were described as producing 5000 quintales (Sandi-Morales et al 2006, 107), whereas the recent "micromill revolution" (Mena 2014) involves many more mills, most of which produce less than 500 quintales.

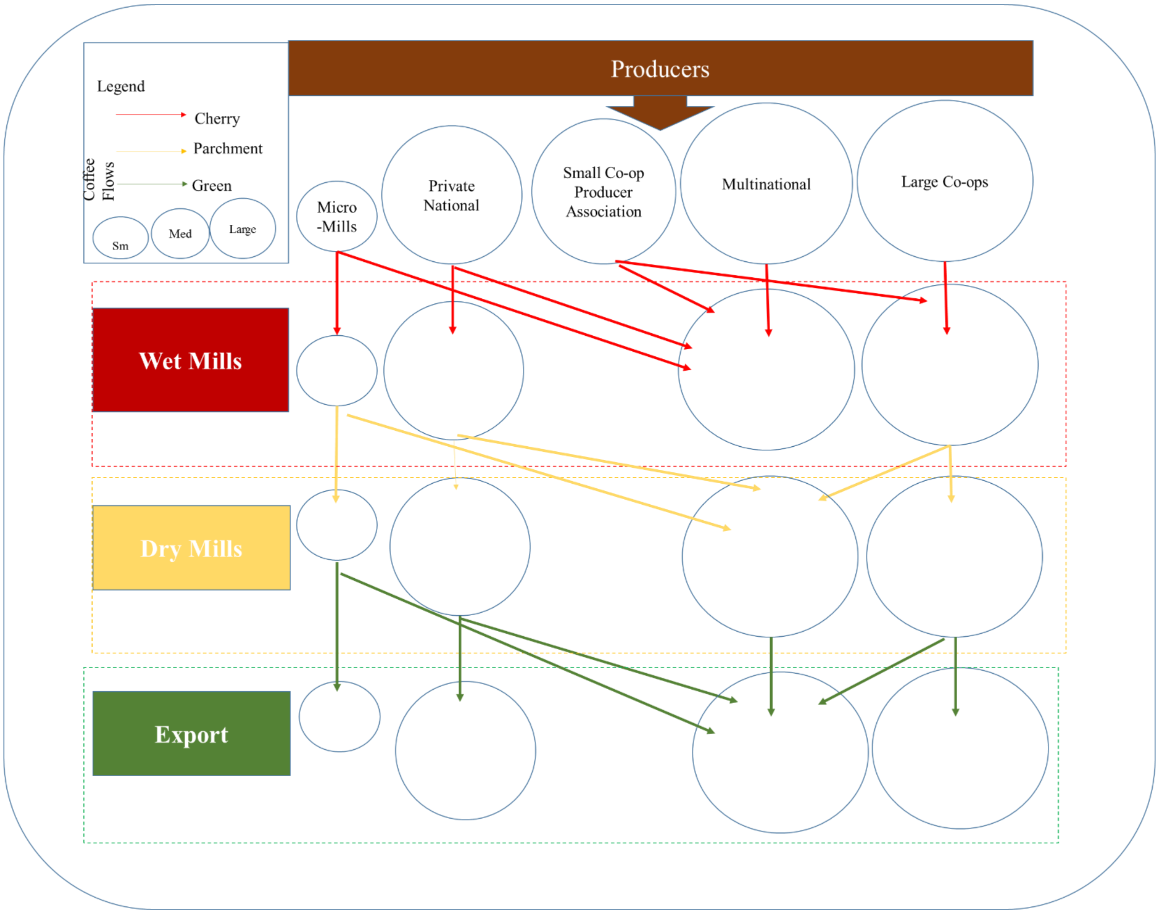

Figure 4-6 Supply Chain Configuration for Costa Rican Coffee.

4.6.4.2 <u>Coffee Governance in Mexico</u>

Mexico, unlike Costa Rica, does not have a law governing coffee transactions and redistributing profits throughout the supply chain. The government does support a Coffee Productivity System established by Mexico's Rural Development Law. The Coffee Productivity System supports state-level coffee bodies that funnel federal assistance to farmers. However, this disarticulated system represents the remnants of a once highly socialized and nationalized coffee industry.

During the 1960s-1980s INMECAFE made large state-sponsored investments in small farmer coffee production, often in marginal areas in terms of cup quality. This was largely part of a patronage network, and thus the INMECAFE system was strongest in areas where the Mexican corporatist political system was strongest. INMECAFE nationalized half of the Mexican coffee harvest during the 1970s and 1980s, and controlled exports (Porter 2000, 121). The INMECAFE model involved organizing villages, many tied to the ejido system, into economic production and marketing units (UEPCs) under the CNC (Consejo Nacional Campesino), and "providing them advance credit, stable prices, and a "technological package" that increased yields by applying synthetic fertilizers and simplifying the shade cover for their coffee plots." (Jaffee 2007, 50). In part they did this by guaranteeing prices, which had the effect of increasing the number of coffee farmers by 150% (Celis Callejas 2015).

The system also was organized around a state fertilizer company FERTIMEX and state bank BANRURAL. Accordingly, there was an institutional structure for supporting the social sector in Mexican coffee that was organized at the community level by UEPCs aggregated up to the CNC, and then associated with INMECAFE, FERTIMEX, and BANRURAL. This system started to unravel with Mexico's entry into GATT (Global Agreement on Tariffs and Trade) in 1986, which required that these organizations be privatized and opened to competition. This effectively removed access to credit and agricultural inputs from the social sector in the corporatist model (Porter 2000, 120-123), and was ended with the dissolution of INMECAFE in 1989.

During its decades of activity, INMECAFE gradually acquired private mills, nationalizing most of the milling capacity, and working with thousands of state-sponsored community level production nodes (Perez-Akaki & Echenove-Huacuja 2006). In Veracruz INMECAFE operated wet mills and dry mills, and in Chiapas, they operated dry mills, but put significant efforts into distributing decoupling machines and encouraging drying patios. INMECAFE operated wet mills where practical, or necessary for mechanical drying, and dry mills in areas with more remote populations (Porter 2000). Because INMECAFE virtually guaranteed profits to coffee growers, coffee acreage and production expanded quickly, both to areas which were marginal in terms of cup potential, but also to socially isolated areas in Chiapas and Oaxaca (Jaffe 2007).

Mexico's venture into coffee was in part to preserve the idea of national self-sufficiency around the ejido model, and partly to preserve the corporatist political model and protect against rural upheaval (Jaffee 2007). The expansion of INMECAFE in part represented government efforts to address discontent in rural areas, especially indigenous ones, often connected to leftwing movements in the 1970s (Porter 2000). Mexico tried to create a national model for coffee, but chose to do so with state enterprises, and with the added challenge of a politically complicated rural sector split generally between socialized ejido areas, and surviving large haciendas. The ejido system of the

Mexican revolution was the strategy to unwind this; unlike Costa Rica, Mexico had a larger rural peasant population that had long-standing resentment of its hacienda system, and great physical distance from population centers. This was especially the case for Chiapas, where large scale land distribution had never occurred, and where industry efforts such as INMECAFE could only stall social conflict, which erupted in the 1980s and 1990s with massive land invasions and the Zapatista uprising.

INMECAFE operated successfully during the International Coffee Agreement's (ICA) period of export quotas, because international restrictions on the supply of commodity grade coffee kept prices high and gave sellers bargaining power. However, the mills were part of the political network of the governing political party (PRI), meaning profits were often diverted, investment in technology lagged, and quality standards dipped, hurting the reputation of Mexican coffee in international markets. After the collapse of ICA in 1989 these mills faced serious operational challenges and INMECAFE was dissolved, throwing a heavily distorted coffee sector into chaos (Martinez-Torres 2006, 11). Many commentators attribute INMECAFE's demise to neoliberalism (Jaffee 2007), and surely the viciously abrupt dismantling of the INMECAFE system had an ideological bent, but the corporatist system had built a flawed coffee chain in Mexico, one where quality controls had weakened in the face of political pressure, and one where the expansion of coffee had as much to do with a rural political project that required loyalty to state-sponsored structures as it did with producing a profitable agricultural product. INMECAFE operated in a diverse national context but depended on a centralized operational structure. Thus, compared to Costa Rica's ICAFE, INMECAFE in Mexico was at the same time a more centralized command and control agency while it operated in a much larger, more diverse, socially stratified country.

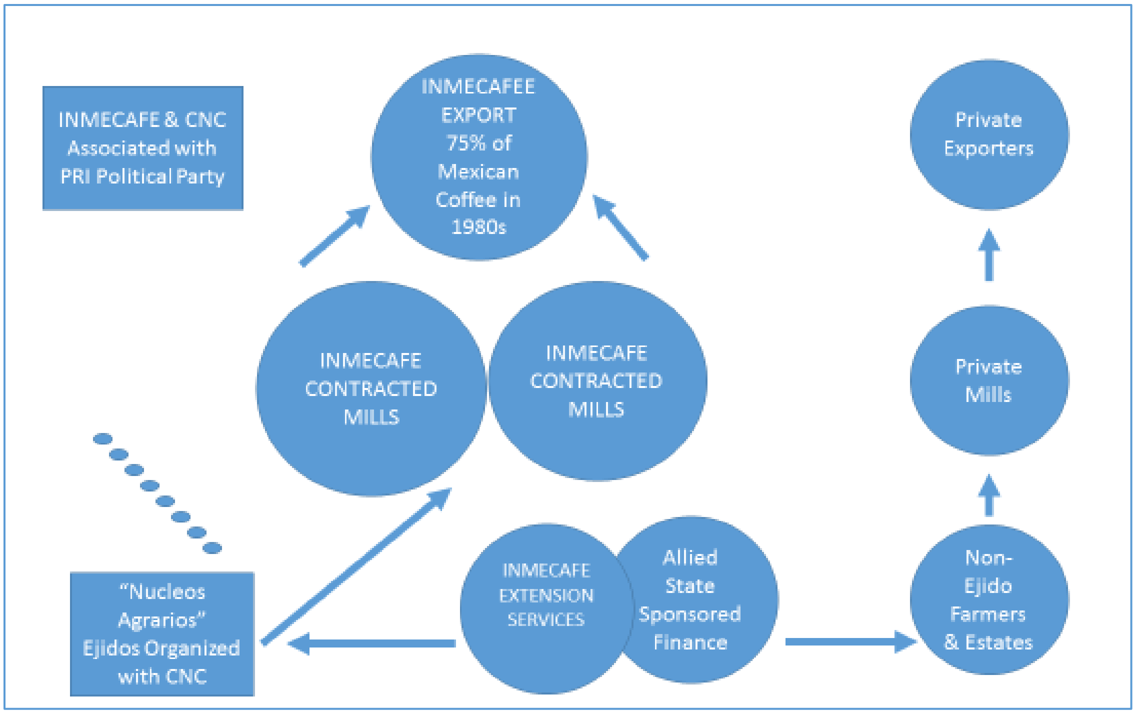

Figure 4-7 Structure of Mexican Coffee Industry Pre-1993

In the 1990s, conflict emerged over what to do with INMECAFE's infrastructure among all three of these groups in a time when the federal government showed less interest in coffee. As the state unwound INMECAFE's assets, in some places mills went to private actors, in others they were transferred to cooperative groups linked to the social sector, in others yet a new national body focused on supporting indigenous development (CDI) played an important role, although it had never played an agricultural role. As Robert Porter recounts, all this happened in a disorganized manner. INMECAFE had 65 dry mills and many wet mills, which were handed over to organizations with little capacity. often those associated with the state sponsored rural development bodies linked to ejidos, the CNC, but also to CNOC organizations that were involved in the cooperative movement, and later organic coffee (Porter 2000, 123). Few of the CNC sponsored groups were effective in establishing themselves in the export sector. Furthermore, because INMECAFE had been a purchasing agent, its liquidation led to a system where few farmers had direct access to markets. Few of these mills operate today, but the issues involved set the context for today's coffee sector. Financial adjustment programs for the social sector were implemented through the Federal National Indigenous Institute and the social services secretariat, state bodies without agricultural expertise (Porter 2000, CDI 2012).

The Indigenous Institute did support transitions to organic coffee production (Martinez 2007), but its focus was to provide social support, and few of its ventures into the coffee sector were fully informed by experience governing and supporting agribusiness. In 1993 a government agency with the business of agriculture in its mission, the Secretary of Agriculture , once again started to play a role in coffee, through the Mexican Coffee Council, which led to tension between INI and the Secretary of Agriculture (Porter 2000). The government switched governance to the Mexican Coffee Council, creating a coffee section under the core crops program PROCAMPO in 1996, and then the Coffee Product System in 2006 (Perez-Akaki 2013, Porter 2000), drastically reducing technical assistance to farmers, and reversing policies which had expanded volume-oriented lowland coffee production.

Even after these reforms took the government out of the production of coffee, the government remained the main source of credit (Parizat et al 2015), through organizations such as Banco de Mexico's FIRA, and BanRual (agricultural sector credit agencies). Coffee governance has most directly been through AMECAFE (la Asociación Mexicana de la Cadena Productiva del Café), which is a quasi-public body representing the coffee sector in the Coffee Product System, and programs such as the Coffee Fund Recovery Trust (Fircafé) (Perez-Akaki 2013).

However, tensions continue over the role of AMECAFE and SAGARPA in governing coffee, and the participation of Mexican state sponsored financial institutions in the sector is often project based through FIRA (Banco de Mexico) and BanRural. In effect, Mexico's coffee sector has inherent tensions between the social sector and larger producers, between indigenous interests and other state programs, between producers aligned with CNOC and CNC, and between the cooperative sector and multinational export companies.

Underneath the national system is a series of state coffee bodies. In Chiapas, this group is COMCAFE, now INCAFETCH. Veracruz does not have a state-sponsored coffee office, but it has a large producers' group AVERCAFE. Both states have Coffee Product System Committees, which represent the local industry in its relationship with SAGARPA (Secretary of Agriculture) and AMECAFE (Mexican Coffee Production Chain Association). These are efforts to create more comprehensive state-level programs for coffee, but they are largely dependent on SAGARPA and federal funding mechanisms.

However, in general, current opportunities for local support of coffee production are limited, and payments to support farmers insignificant; there are no bodies with sufficient capacity to provide outreach and technical support to every small holder farmer. Most payments are made via organizations that represent farmers, such as those affiliated with CNC or CNOC, although in some cases multinationals are organizing farmer groups for the purpose of certified coffees, and to bolster production. Larger support mechanisms operate mostly through SAGARPA and are often non revolving grants. Some state-sponsored lenders have programs to boost productivity aimed at groups organized under multinationals and farmers organized with cooperatives, and these often provide subsidies for technicians, but they are contingent on a cooperative or mill participating in specific programs.

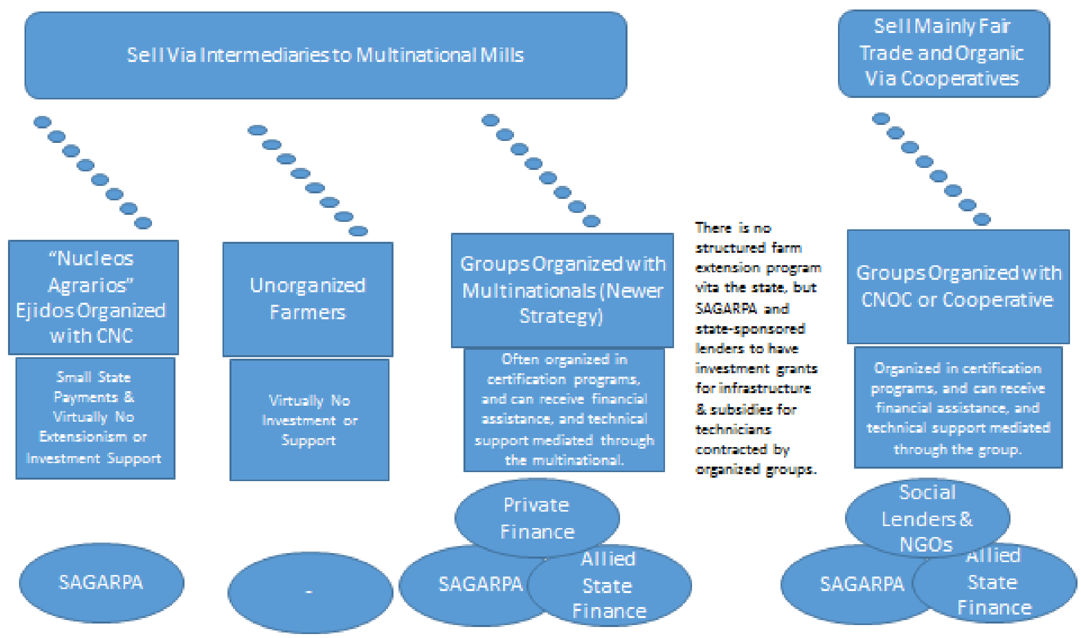

Figure 4-8 Structures of support and commercialization for smallholder farmers 2000-present

The lack of a central organizing structure for the Mexican coffee supply chain means that there are a variety of configurations at the regional and cluster level. One distinguishing aspect of the coffee industry in Mexico vis a vis Costa Rica is that a large portion of coffee sold by small-hold farmers is sold to intermediaries, derogatively but ubiquitously called coyotes. This leads to a system whereby mills are often much more removed from farmers. These private buyers (the coyotes) have differing relationships with mills, and may be independent purchasing agents, or have a credit and contractual relationship with the mill. This is true in both Chiapas and Veracruz. Veracruz, is more like Costa Rica, because farmers there sell much of their coffee as cherry (unprocessed) to wet mills, a result of less isolated growing areas, rainfall patterns which necessitate mechanical drying, and old INMECAFE structures (Figure 4-9).

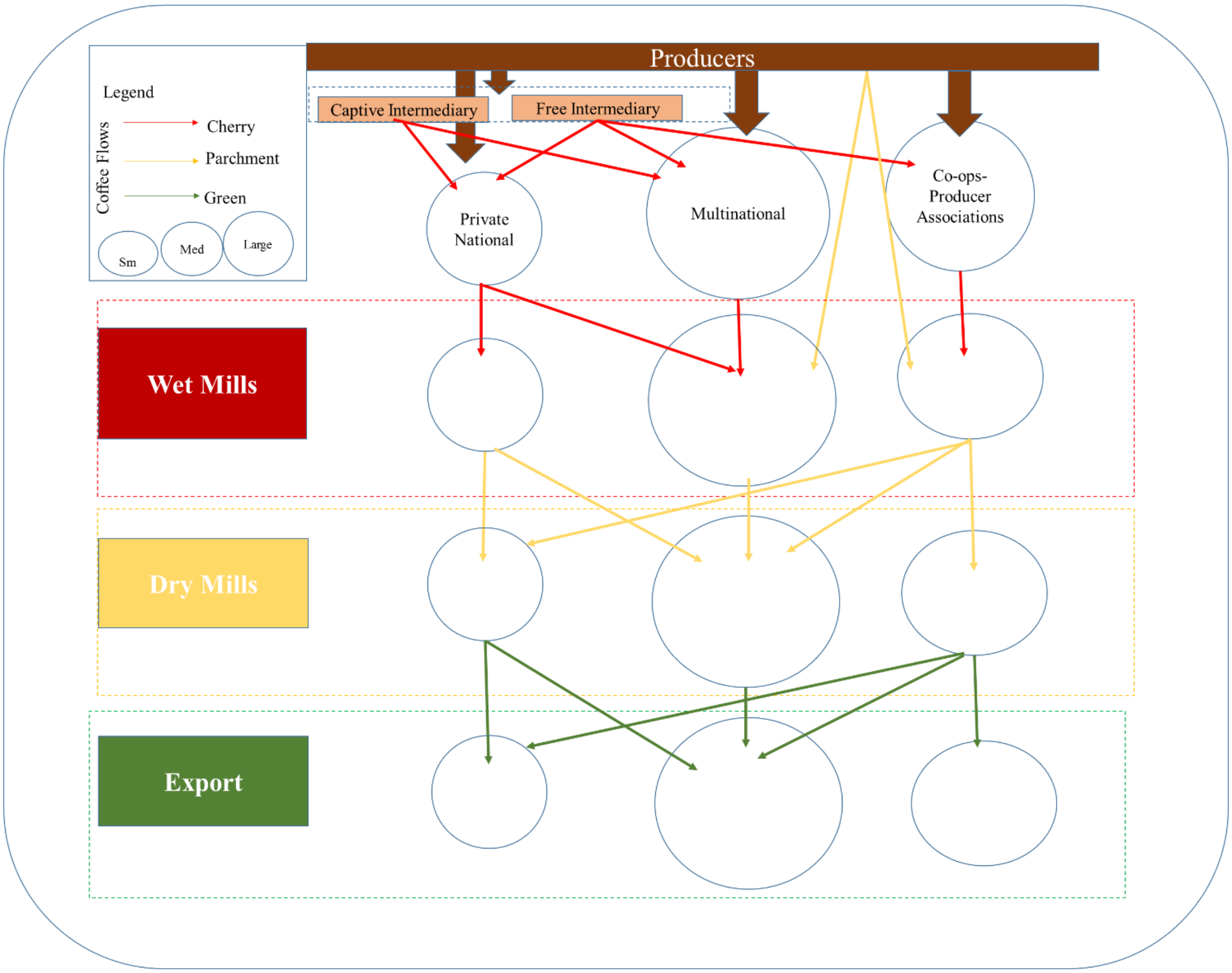

Figure 4-9 Supply Chain for Coffee in Veracruz Cases

In contrast, the Chiapas model is based around farmers milling on-farm, or at the communal level, and then delivering coffee as parchment (semi-processed) to warehouses or dry mills run by different types of organizations (Figure 4-9Figure 4-10).

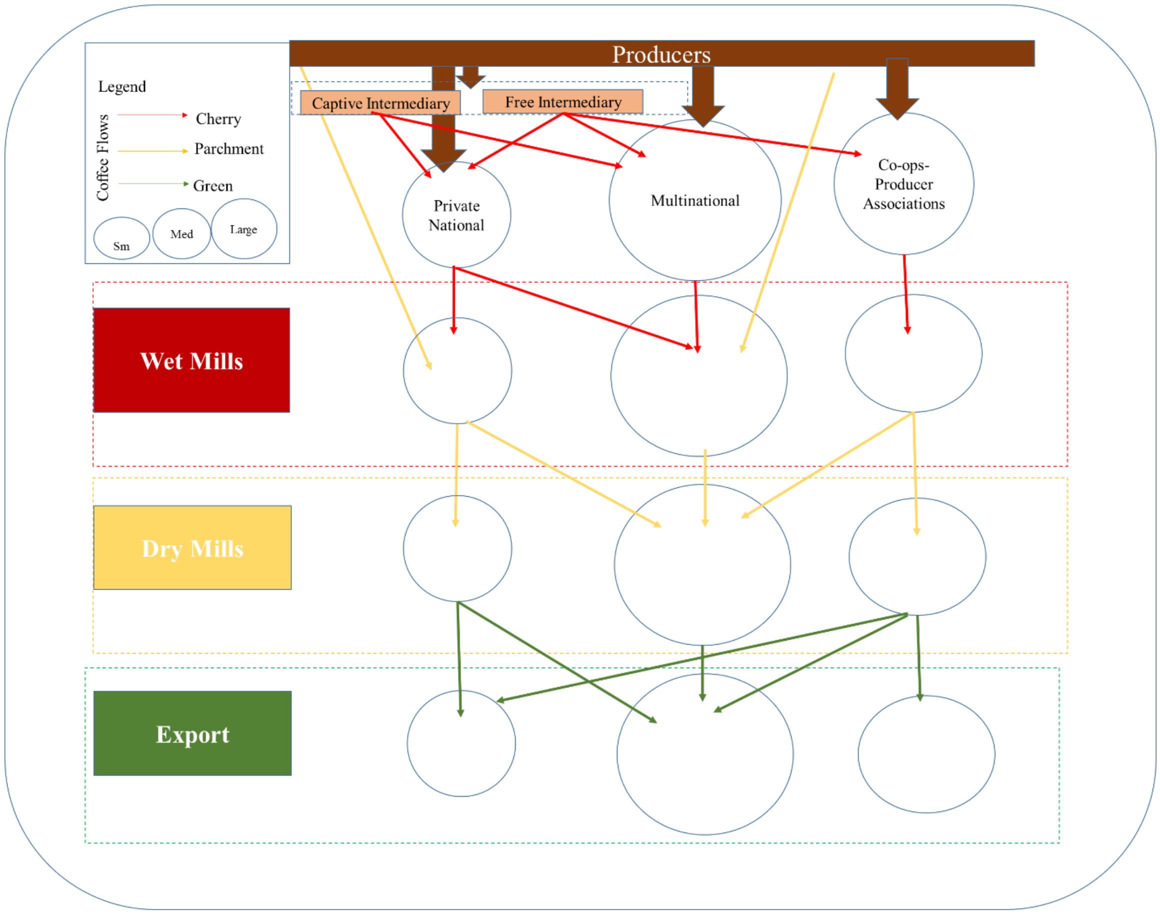

Figure 4-10 Supply Chain for Coffee in Chiapas Cases

4.6.4.3 Cooperatives in Costa Rica and Mexico

Cooperative governance is not a monolith, and can vary in terms of its structure, function, and effectiveness, which all impact support for farmers and the percentage of the export value of the crop that they receive (Parizat et al 2015). The history of cooperatives in Mexico and Costa Rica is quite distinct, resulting from the fundamental differences in their coffee governance structures (Williams 1994, Samper 2010, Martinez-Torres 2006, Gonzalez & Nigh 2005), and must be analyzed in the context of understanding how institutional variation impacts adaptive efficiency within global value chains. Costa Rican cooperativism was sponsored by a large national project of market anchored socialism during the 1960s, when coffee was front and center of the country's export strategy. Mexico has always had a more diverse economy, and even while coffee boomed in the 1970s and 1980s, it was only a small part of the national economy while the government's attention to coffee was focused more around rural livelihoods.

4.6.4.3.1.1 Costa Rica

Costa Rica started to support cooperatives with socialist inspired, but still market oriented governments after the 1948 civil war (Williams 1994, 162), and also to grant land concessions to farmers in agricultural frontiers. Most formed in the 1960s, when government sponsored banks gave loans on favorable terms to establish them and assisted in the formation of an export federation. Most of the member/owners of these cooperatives were smallholder growers, but they also included medium and larger farms, and in many cases the cooperatives turned into organizations that incorporated a large swath of a town's farming community under one milling system.

Unlike Mexico, Costa Rica did not socialize its mills and it supported a system of reliable free-hold land ownership, although in the 1950s land on the agricultural frontier was given to farmers from the Central Valley, and in some areas mills and estates owned by foreigners were given to local farmers, with formerly private mills converting to cooperatives. From the start,, the Costa Rican cooperatives were part of a larger rural government program in the 1960s, when coffee was the most important part of the Costa Rican economy (Samper 2010, Williams 1994), and went through a period of consolidation between 1960 and 1990 (Orozco and Diaz-Porras 2006).

Institutional stability has characterized Costa Rica, and today, many cooperatives in Costa Rica are dominant local actors and vertically integrated exporters with professional management (Parizat et al 2014, ICAFE 2013). Cooperatives generally operate within defined geographical regions, with limited overlap, such that cooperatives rarely compete for the same coffee, and membership is made up of a large swath of local growers centered in one or two towns. Thus, in many prime coffee growing regions, cooperatives are the main locally present social and economic institution, and in many places a large majority of small to medium sized farmers are members, giving cooperatives social and political clout. This orientation may have led to a more business oriented cooperative sector, which is largely unaligned with anti-hegemonic social movements. Today several Costa Rican cooperatives are among the leading export and milling firms in the national industry.

4.6.4.3.1.2 Mexico

In Mexico, the cooperative movement has attempted to fill the void left by the demise of INMECAFE for the "social sector" by focusing on Fairtrade and organic coffee niches (Martinez 2007). Cooperatives in Mexico started later than in Costa Rica. Cooperatives started, often as an alternative to the PRI-affiliated CNC (Perezgrovas 2002, Martinez-Torres 2007), but very much alongside the INMECAFE model. These were alternative peasant organizations, and they often sprang up in areas where state-sponsored coffee and traditional growing practices were weakest, such as Chiapas. The cooperatives were thrust into more important roles when INMECAFE closed, but the period of market upheaval was hardly an ideal time to incubate new forms of institutional governance, and cooperatives tended to go through cycles of large membership growth, institutional crisis, problems with payments, and then membership attrition (Perezgrovas 2002, 3).

In Mexico, cooperatives arose primarily among the "social sector," and are especially linked to organic coffee production (Martinez 2006, Jaffe 2006). Cooperatives are often splintered, and one town can have multiple competing cooperatives with different ideological bents, some anti- multinational, some pro-government, etc. Moreover, many farmers are organized in groups that help them obtain small payments from SAGARPA, and do not run a mill or sell coffee. One result of the membership of Mexican cooperatives coming predominantly from the "social sector" is a more fractured cooperative sector due to the emergence of smaller cooperatives based around community trust networks.

In Chiapas, and to a lesser extent Veracruz, a single community may have multiple competing farmers' organizations (some grouped under larger second level cooperative structures) alongside the private intermediary system. In Veracruz, cooperatives run wet-mills as they do in Costa Rica, and in this sense the cases are directly comparable to the Costa Rica cases, but the volumes that they process are much lower than in Costa Rica, and organizational structure remains more fractured at the geographic level.

These differing historical contexts, or enabling environments, have led to different ways of adapting to changes in the Global Value Chain. It is true that "declining competitiveness as a result of quality problems, insufficient finances, and a lack of market access" (Parizat et al 2014, 80) in the 1990s, affected most organizations in both countries. However, many coffee cooperatives in Costa Rica are large and have gradually incorporated professional management. Those in Mexico often have a leadership structure still operated by members, and rely on outside advisors. These advisors have their own networks, with many having previous experience in social organizations or government, and often having links to CNOC or other organizations, and either focus on supply chain or government programs. The historic link between Mexican cooperatives and Fairtrade has meant that they operate with a vision of both business orientation and social support and charity.

CHAPTER 5. INTRODUCTION TO CASES

5.1 Description of Cases

5.1.1 Costa Rica Cases

ICAFE has divided the country's coffee producing areas into eight administrative areas. Because these administrative units represent locally defined functional industrial areas for coffee agriculture, they generally function as good estimates about the geographic range of local clusters. These units are often multi-jurisdictional, spanning several municipalities.[18] My cases focus on three of these, albeit in a slightly different configuration than that used by ICAFE. The first region is Los Santos, which for particular reasons due to geography, I have divided into two cases; these comprise my first two clusters. Most parts of Los Santos have very favorable (prime) conditions for coffee production. My other two Costa Rica cases are Turrialba and Perez-Zeledon, both regions with varied climatic and quality conditions (See Figure 5.7 below). I classify them as "non-prime" areas, because of their relative natural disadvantages.

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[18] Because regions are often functionally characterized by their internal labor markets, as is the case with MSAs, they heavily overlap with local industrial clusters which tend to dominate these markets. Regions in U.S. Literature often focus on Metropolitan Statistical Areas as defined by the Census or Economic Areas as defined by the Bureau of Economic Analysis (BEA)(Porter 2003). The definition of a region can be vague: "An economic region is a district or administrative division of a city or territory that is designed according to some material distributive or productive criteria." (OECD, n.d.) Despite this the idea of multi-level and multi-jurisdictional areas of economic activity and governance play a key role in the concept. Given that the size of officially defined coffee regions is sometimes quite small, the idea can overlap with the concept of local coffee economies. In practice, local and regional development are often treated as a single issue (Pike and Rodriguez-Pose 2007, Leigh and Blakely 2013), and contrasted with larger state/provincial or national level policy approaches.

Figure 5-1, *Case Study Areas*, depicts all coffee growing municipalities in Costa Rica, and the four specific cases in this study. Over the period of this case study (1999-2014), farmers in the jurisdictions covered by the two low-coop cases on average sold less than 15% of their total coffee to cooperatives, while farmers in the areas covered by the two high-coop cases sold over 50% of their coffee to cooperatives. The low-cooperative cases had cooperatives at the beginning of the study period, but they all closed in the early 2000s. Even before closing, the relative importance of these cooperatives was lower than in the high-cooperative regions (ICAFE 2015).

Because institutional variation is what I could control for in selection before starting the study, I used this element of the adaptive efficiency model as the principal case selection criterion. My case selection was built to test institutional questions, mainly Hypothesis 1 (

Table 4-3 Hypotheses Addressed by Model Elements and Approach

Hypotheses by AE Model Elements		*Measures by Approach*		
		Social Network Analysis	**Case Studies**	**Regressions**
Institutional	**H1:** Clusters with strong cooperatives will be relatively more resilient	Cohesion and Centrality Measures	Documentation and comparison of role of local mills in adaptation through qualitative interview data and secondary sources	Percentage of Coffee Sold in a District that is Sold to Cooperatives
	H2: Cluster resilience will correspond to areas whose institutions encourage value chain upgrading	n/a	Documentation and comparison of innovation through qualitative interview data and secondary sources	n/a
	H3: Communal land tenure will lead to lower levels of on-farm investment and upgrading in the absence of strong public mechanisms to support farmers. These differences will primarily manifest themselves at the national level.	n/a	Comparison of Mexico and Costa Rica Outcomes	n/a
	H4: Clusters where producers are primarily from historically marginalized indigenous cultures will have weaker networks with external actors within public institutions and the coffee value chain . These barriers will affect resilience.	n/a	Quantitative comparison of outcomes, Qualitative interview and secondary data and comparison with Chiapas cases	n/a
Relational	**H5:** Cluster resilience will correspond to stronger social networks and social capital within the cluster (akin to bonding capital).	-	Quantitative comparison of outcomes, Qualitative interview and secondary data and comparison	n/a

	1. More cohesive collaboration and knowledge networks.	Cohesion Measures	-	n/a
	2. Locally anchored institutions (especially cooperatives) as both gatekeepers of knowledge and policy advocates	Centrality Measures	-	n/a
	3. More trust and collaboration around key resilience topics among local firms	Network Strength Measures & Cluster Governance Questions	-	n/a
	H6: More resilient clusters will have more open knowledge and collaboration networks (akin to bridging capital).	-	Quantitative comparison of outcomes, Qualitative interview and secondary data and comparison	-
	1. More and stronger links to external actors in the coffee GVC	Comparison of Links by Institution Type and Hubs	-	n/a
	2. More collaboration and trust with publically oriented institutions (e.g. Government, Educational, and NGOs)	Cluster Governance Questions	-	n/a
	H7: Social capital within an industry is driven by both local variation, and national institutional context	National Level Comparisons of Cluster Governance and Network Strength Measures	Qualitative interview and secondary data and comparison	n/a
Agglomeration	**H8:** Resilient areas will have better access to labor pools and transportation networks.	n/a	n/a	Distance Measures to Collection Points & Rural Population
	H9: Resilient areas will benefit from the industrialization economies provided by greater concentration of industry infrastructure and intermediary organizations.	n/a	Qualitative interview and secondary data and comparison	Number of Mills Purchasing in District

) that areas with strong locally embedded firms, especially cooperatives, will be more resilient. In six of the cases, which I divide into three pairings, I compare coffee regions primarily distinguished from one another by the presence or absence of vigorous cooperative governance. In a fourth pairing, the Chiapas cases, I contrast two regions where cultural differences are the primary distinguishing factors in terms of how they interface with the GVC. This selection tests Hypothesis 4: "Clusters where producers are primarily from historically marginalized indigenous cultures will have weaker networks with external actors within public institutions and the coffee value chain." Here I do not predict indigenous areas will be less resilient per-se, but rather their history of marginalization and language barriers will present challenges in the GVC relationships not experienced by other clusters.

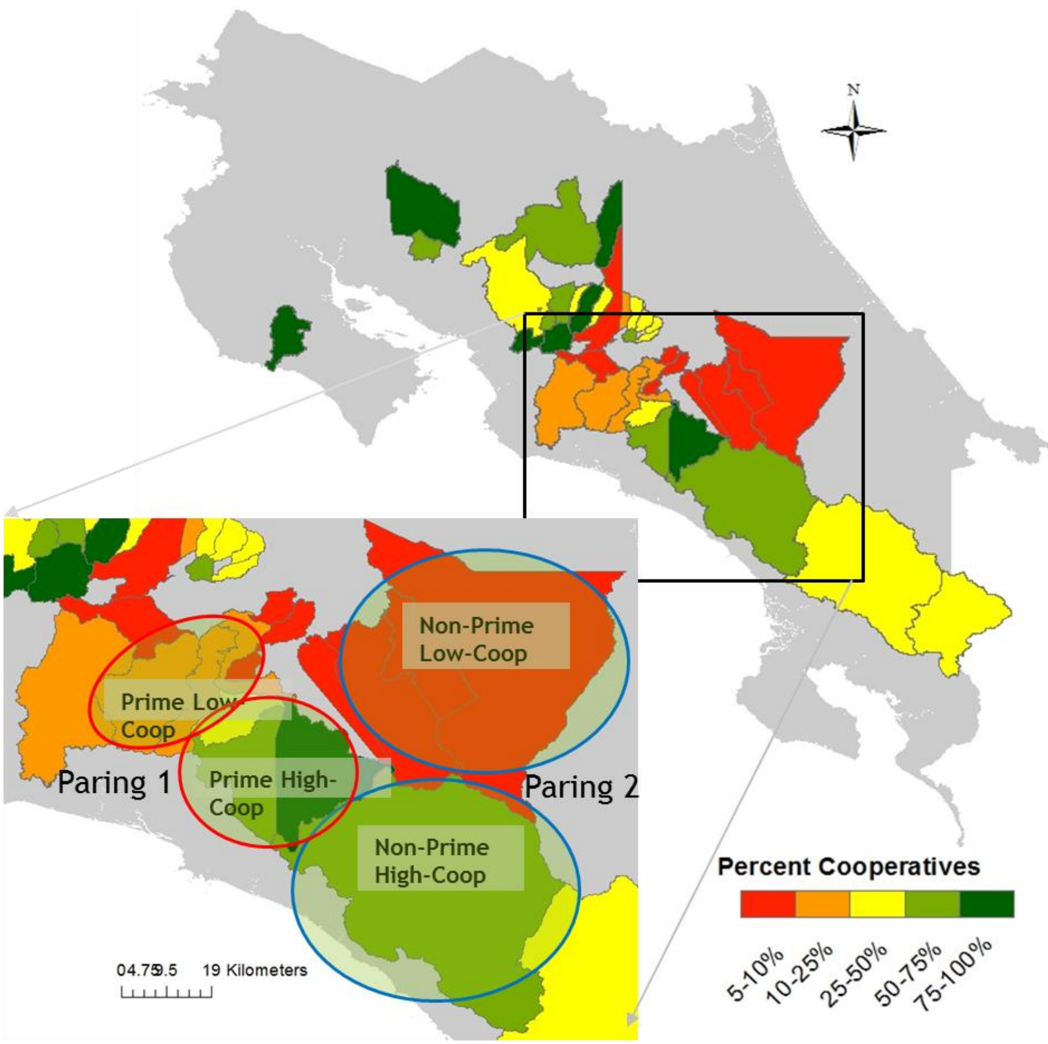

Figure 5-1 Case Study Areas Costa Rica (Pairing 1 (Prime)-Red Circles, Pairing 2 (Non-Prime)-Blue Circles)

In selecting the cases, I accounted for global trends towards origin differentiation and coffee geography in the last 20 years (Samper 2010, Rueda & Lambin 2013). Increasingly, geographically-linked quality differentiation has created major divisions in terms of market access and price discrimination for prime and non-prime producing regions. The emergence of the specialty coffee market meant that certain geographies have natural advantages in global value chains due to the special value of their *terroir* (soils, elevations, rainfall patterns, and temperatures). Therefore, I selected pairs of regions that had similar production conditions, so that comparisons could be made for regions with different institutional characteristics, but similar potential to develop regional reputations within the coffee industry.

All four of these regions have strong coffee producing traditions stretching back at least 50 years, and all regions were high-volume coffee producers at the beginning of the study period. Before finalizing these case selections, I consulted with local experts to confirm the suitability of the comparison. Table 5.1, *Four Costa Rica Comparative Cases*, shows the conceptual pairing used in this paper.

Table 5-1 Four Costa Rica Comparative Cases

Comparative Case Criteria Costa Rica	Pairings	
	Prime Conditions	Non-Prime Conditions
High-Coop > 50% Coops	Los Santos (Dota, Tarrazu, Leon Cortes)	Pérez-Zeledon (one municipality)
Low-Coop<15% Coops	Los Santos (Acosta, Aserri, Desamparados, Coralillo)	Turrialba (Turrialba, Jimenez, and Paraiso)

The high-coop prime region consists of three contiguous cantones (municipalities), and the low-coop area consists of three cantones, and a distrito (sub-municipal district) of a fourth canton.

The two non-prime regions, Turrialba (Non-Prime Low Coop) and Perez Zeledon (Non-Prime High Coop) are organized around larger cantones with more varied agriculture. Both regions have large areas of high yield, lower elevation (sub 800m), coffee production, and as well as some geographically remote areas of higher elevation coffee.

In selecting these cases, I verified that they had roughly similar baseline production realities as well as similar growing conditions. In terms of mill structure, the Prime cases and the Non-Prime cases had a similar density and diversity of mills types between pairs. The Non-Prime regions started with fewer mills than the Prime regions, but these cases are not compared directly. Additionally, I verified that baseline numbers for production volumes were roughly similar in each pairing. In the Prime region the low cooperative case produced about 73% of the volume found in the high cooperative case. However, in the Non-Prime area, the low-cooperative case produced 112% of the volume of the high-cooperative case. All of this suggests that the pairings were reasonably balanced in terms of the population of mill actors, the amount of coffee produced, and the amount of land dedicated to coffee production (see Table 5.2). For these cases, I will look at response variables including production volumes, change in number of mills, and change in coffee land use.

Table 5-2Coffee industry data for each case study in Costa Rica (ICAFE-INEC 2004 & 2006)

	Farms	Total HA Planted	% HA Operated by Owner	% HA Rented	Average Farm Size (HA)
Costa Rica Prime Low Coop	2,959	17,903	93	7	6
Costa Rica Prime High Coop	1,732	15,130	99	0	9

Costa Rica Non Prime Low Coop	2,144	26,892	94	4	13
Costa Rica Non Prime High Coop	3,991	29,344	96	1	7

5.1.1.1 Costa Rica Prime Description

1. Desamparados-Frailes-Aserri-Acosta (Costa Rica Prime Low Coop): This area is separated from Costa Rica Prime High Coop by a mountain range, but it presents similar growing conditions. It is closer to San Jose than Prime High Coop, but mostly lies outside the GAM. Cooperatives in the area closed during the 2000s, but always had a much lower market share than in the comparison region.
2. Dota-Tarrazu-Leon Cortes (Costa Rica Prime High Coop): This is a leading area for coffee production in Costa Rica that offers prime growing conditions. It is dominated by cooperatives with over half of its coffee harvest being sold to three main cooperatives.

5.1.1.2 Costa Rica Non-Prime Description

1. Turrialba- Jimenez-Paraiso (Non-Prime Low Coop): This is a traditional coffee growing area, but one that has declined due to its lower elevation; however, not all farms in the area are low elevation. Turrialba coffee is only 8% cooperative; in fact, the only cooperative active there is based in another ICAFE region of the country.

2. Perez-Zeledon (Non Prime High Coop): This is another low elevation growing region that differs from Turrialba in that it has strong cooperatives (50% of volume).

5.1.2 Mexico Cases

Within Mexico, I focus on producing areas in Veracruz and Chiapas, which are both states in Southeast Mexico (Figure 5-2Chiapas (red) and Veracruz (green) within MexicoFigure 5-2).

Figure 5-2Chiapas (red) and Veracruz (green) within Mexico

These are the two leading coffee producing states in Mexico (see Table 5.3 below), and have been since the 1990s. Veracruz represents the most traditional producer region in Mexico, and Chiapas has emerged as a leader in organic coffee, of which Mexico is the world's leading exporter.

Table 5-3 Lead Mexican Coffee Producing States (SAGARPA)

	HA Planted	Tons Harvested	Yield (Tons/Ha)
CHIAPAS	253,764	499,337	1.968
VERACRUZ	147,384	357,977	2.575
OAXACA	142,766	129,756	0.939
PUEBLA	72,175	159,322	2.939
GUERRERO	47,190	41,784	0.886
HIDALGO	25,821	33,992	1.35
NAYARIT	17,693	25,358	1.434
SAN LUIS POTOSI	17,154	16,247	0.981
JALISCO	3,835	4,334	1.13
COLIMA	2,378	2,448	1.029
TABASCO	1,040	847	0.814
MEXICO	479	1,096	2.362
QUERETARO	270	243	0.9
MORELOS	78	126	1.61
MICHOACAN	13	51	3.95

Both Chiapas and Veracruz are characterized by high levels of poverty, and large rural populations, many of which are indigenous, of Maya descent.

All of the Mexico cases include areas where the natural conditions would permit coffee production aimed at specialty markets (prime). The areas included in the Veracruz cases all include farms that have won, or placed highly, in the Mexican Cup of Excellence, as does one of the Chiapas cases. The other, has not entered coffee in Cup of Excellence, but experts interviewed for this project indicated that it had quality potential on par with the best areas in Mexico. Accordingly, the Mexican cases have controlled for natural factors, and vary primarily on 1) presence and absence of strong cooperatives, in the Veracruz cases, and 2) in terms of local culture in the Chiapas cases.

Table 5-4 Comparative Case Criteria Mexico

(Pairing 1) Central Veracruz		(Pairing 2) Chiapas	
High-Coop	Huatusco Region	Mestizo Culture	Jaltenango/La Concordia Region
Low-Coop	Coatepec Region	Indigenous Culture	Los Altos Region

5.1.2.1 Veracruz Description

Veracruz has high levels of *ejidos*, and represents one of the traditional core agricultural heartlands of Mexico, but before the 1950s coffee in Veracruz was dominated by large land-holdings tied to local elites. Some of these estates still exist, but they were significantly broken up under rural reforms in the 1940s-1970s. Because of those historical reforms, in the parts of Veracruz under study, most coffee is grown by mestizo farmers with less than three hectares of coffee (AVERCAFE 2009), many still farming on *ejido* land.

Indigenous producers are particularly important in Mexican coffee (Martinez 2007, Jaffee 2007), especially in Chiapas, Puebla, and Oaxaca. Veracruz has large indigenous areas, but they are not studied in this project. Instead, I focus on a series of municipalities in the Coatepec and Huatusco regions, which are among the old Mexican coffee bastions. These are most comparable to Costa Rica, because of larger land holdings, a mix of private and *ejido* lands, and mestizo culture (sharing identity with Mexican national and regional Latino identities). More importantly, the coffee commodity chain in Veracruz is primarily organized around wet-milling, as is it is Costa Rica.

The Veracruz cases are more like my Costa Rica cases than the Chiapas cases. Although communal property exists there, this form of property ownership is less common than in

Chiapas, and differences among selected cases are primarily due to presence or absence of cooperatives. The Veracruz cases are climatically very similar to one another (AMECAFE 2011) and traditional leading regions for Mexican coffee (Figure 5-1), that differ mainly in terms of cooperative governance.

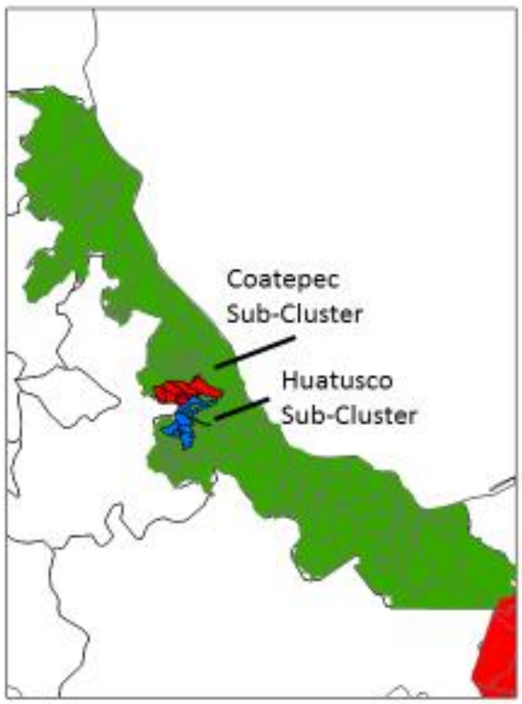

Figure 5-3. Veracruz Cases, Coatepec (red) and Huatusco (blue)

Unlike in Costa Rica, I was not able to specifically account for the percentage of coffee sold to cooperative organizations. What I could select on was the presence or absence of cooperatives in otherwise similar areas, which I refer to as Veracruz High Cooperative and Veracruz Low Cooperative.

Huatusco (Veracruz High Cooperative): Huatusco has a strong cooperative presence, and was one of the first areas of the country to have farmers organize into a strong cooperative in the early 1990s. Huatusco's farmers have slightly larger plots than in the second case, Coatepec, averaging 2.6ha (AMECAFE 2011), but the two regions are traditionally Veracruz's coffee heartland (Table 5-5)

Table 5-5 Huatusco Region (SAGARPA 2008)

Municipality	Working Farms	Coffee		
		Area (ha)		Volume (metric tons)
		Planted with Coffee	Producing Coffee	
HUATUSCO	2 482	7 108.12	7 056.00	16 843.63
IXHUATLÁN DEL CAFÉ	2 970	5 035.62	4 930.94	12 246.57
TOTUTLA	1 973	4 746.88	4 630.45	11 143.76
ZENTLA	1 033	3 971.57	3 937.47	10 126.00
COMAPA	957	2 607.48	2 440.16	5 275.24
TENAMPA	781	1 772.98	1 745.52	4 258.96
SOCHIAPA	439	1 022.80	1 014.08	3 109.54
TOMATLÁN	602	836.48	827.76	2 000.54
CHOCAMÁN	863	1 078.31	1 070.87	2531.82

Coatepec (Veracruz Low Cooperative): Coatepec is the center for many larger private milling operations, and has leading farms that often place well in the Mexico Cup of Excellence competition. It is near the capital of the state, Xalapa, so urbanization is an issue for parts of the regions. Coatepec has less cooperative presence, with no large cooperative mills, and AMECAFE (2009) noted that the lack of organization among small producers was impeding the region (Table 5-6).

Table 5-6 Coatepec Region (SAGARPA 2008)

Municipality	Working Farms	Coffee		
		Area (ha)		Volume (Metric Tons)
		Planted with Coffee	Producing Coffee	

COATEPEC	1 941	4 087.71	4 014.59	10 490.70
COSAUTLÁN DE CARVAJAL	2 323	4 738.14	4 715.84	8 891.54
EMILIANO ZAPATA	1 967	4 369.61	4 285.80	8 663.05
ALTO LUCERO DE GUTIÉRREZ BARRIOS	1 714	2 934.63	2 812.66	4 698.12
XICO	1 195	2 443.05	2 432.37	4 859.51
JILOTEPEC	957	1 667.35	1 644.15	3 112.87
TEOCELO	1 235	2 673.41	2 653.26	5 304.15
TEPETLÁN	857	1 236.22	1 225.72	2 200.67

5.1.2.2 Chiapas Description

AMECAFE and COMCAFE have designated 13 distinct coffee regions in Chiapas, of which I selected for study parts of two contrasting areas: Jaltenango and Los Altos. I did not use their exact boundaries, eliminating some areas that were too remote from the core.

Much of southeastern rural Mexico is a quilt of localized identities, which became entrenched under the *ejido* system, and a cultural system called *patria chica* (Kelley et al 164, Martinez 2003). Large scale land reform in Chiapas came during a period of peasant uprising in Chiapas in the 1980s and 1990s, flowing from village based systems of social organization. These were fueled by liberationist ideology and local claims for indigenous self-determination, based around local language and shared histories. The Zapatista movement came to embody a period of rural uprisings, where marginalized villages demanded access to larger land holdings. *Patria chica* defined social movements through Chiapas, both indigenous and mestizo, but was strongest in areas dominated by indigenous language.

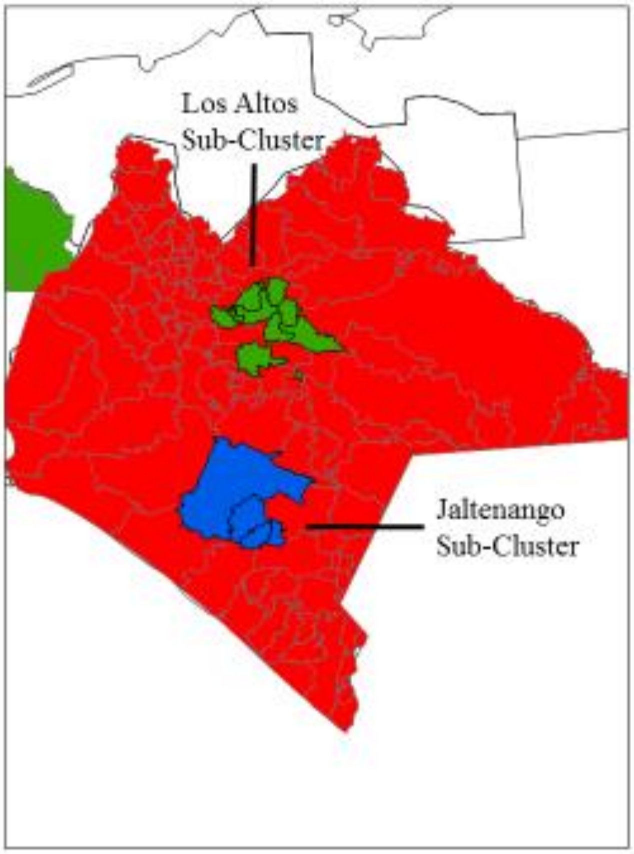

Figure 5-4Map of Cases in Chiapas

Jaltenango (Chiapas Mestizo) is a long-time producer region, now dominated by mestizo *ejido*s, which has many cooperatives in a single centralized location. It is near a major environmentally protected reserve, El Triunfo. Its coffees place highly in the Mexican Cup of Excellence competition. Farms there are larger than in Los Altos (2-4 ha). Jaltenango's coffee supply chain includes estates, cooperatives, multinationals, and one large national firm.

Table 5-7 Chiapas Mestizo

Municipality	Working Farms	Coffee		
		Area (ha)		Volume (Metric Tons)
		Planted with Coffee	Producing Coffee	
ANGEL ALBINO CORZO	1 142	5 003.07	4 797.82	7 422.30
LA CONCORDIA	971	4 046.88	3 937.87	7 623.62
MONTECRISTO DE GUERRERO	1 037	4 159.87	3 762.25	7 205.31
VILLA CORZO*	309	2 044.27	1 891.59	2 880.18
VILLAFLORES*	279	788.60	600.29	1 067.21

Los Altos (Chiapas Indigenous), the second case has numerous micro-cooperatives in very remote areas, and several larger ones in a small city. This region is primarily indigenous, and many producers speak Mayan dialects, primarily Tzotil and Tzeltal. In this region there are leading cooperative firms, but they operate on a smaller scale than in Jaltenango. Land tenure is mostly on *ejidos* and indigenous areas, with farm plots on average smaller than two hectares. This area was a core territory for the Zapatista conflict, and still includes *autonomous* indigenous communities, which are self-governing and non-cooperative with the Mexican state. The only firms that buy and process harvested coffee for export are multinational and cooperative mills and exporters.

Table 5-8 Chiapas Indigenous

Municipality	Working Farms	Coffee		
		Area (ha)		Volume (Metric Tons)
		Planted with Coffee	Producing Coffee	
SAN JUAN CANCUC	3 390	2 806.37	2 655.92	3 998.97
ALDAMA	371	308.21	175.39	294.41
OXCHUC	2 314	2 188.69	2 133.15	3 153.91
PANTELHÓ	1 522	2 179.75	1 946.42	2 871.96
TENEJAPA	3 379	3 007.23	2 979.89	4 463.91
TEOPISCA*	175	161.36	154.64	237.83
CHENALHÓ	2 390	3 177.30	3 043.82	4 684.58
CHALCHIHUITÁN	1 245	1 656.96	1 516.02	2 332.86

5.1.3 Case Selection Summary

In Costa Rica, the cases are divided by High and Low Cooperative areas, and by Prime and Non-Prime growing regions. In Mexico, all the cases are in areas of strong potential quality (Prime) in terms of climate and elevation. Veracruz and Costa Rica have similar supply chains for coffee, so they are the most comparable international cases. Furthermore, Veracruz has neighboring coffee clusters, which are the core historical regions of the state's coffee industry. One has cooperatives, and the other does not. This varies slightly from the selection criteria in Costa Rica, where I selected by the amount of coffee sold to cooperatives. I did not have data to make a similar selection in Mexico, and the newer nature of cooperatives in Mexico, and their emergence as adaptations to the coffee crisis, means that their market position is much weaker than some of their Costa Rican counterparts. This selection criterion allows me to make a richer assessment of the resilience of similar areas where the relative presence of cooperatives in the cluster is High or Low compared to the national industry in which they operate. While it may make cross-national comparison of the Costa Rica and Mexico cases more difficult, it allows for examination of the relative impacts of cooperatives in two very different national industries in Central and North America, which will contribute to the external validity of my conclusions regarding Hypothesis 1

Table 4-3 Hypotheses Addressed by Model Elements and Approach

Hypotheses by AE Model Elements		*Measures by Approach*		
		Social Network Analysis	**Case Studies**	**Regressions**
Institutional	**H1:** Clusters with strong cooperatives will be relatively more resilient	Cohesion and Centrality Measures	Documentation and comparison of role of local mills in adaptation through qualitative interview data and secondary sources	Percentage of Coffee Sold in a District that is Sold to Cooperatives
	H2: Cluster resilience will correspond to areas whose institutions encourage value chain upgrading	n/a	Documentation and comparison of innovation through qualitative interview data and secondary sources	n/a
	H3: Communal land tenure will lead to lower levels of on-farm investment and upgrading in the absence of strong public mechanisms to support farmers. These differences will primarily manifest themselves at the national level.	n/a	Comparison of Mexico and Costa Rica Outcomes	n/a
	H4: Clusters where producers are primarily from historically marginalized indigenous cultures will have weaker networks with external actors within public institutions and the coffee value chain . These barriers will affect resilience.	n/a	Quantitative comparison of outcomes, Qualitative interview and secondary data and comparison with Chiapas cases	n/a
Relational	**H5:** Cluster resilience will correspond to stronger social networks and social capital within the cluster (akin to bonding capital).	-	Quantitative comparison of outcomes, Qualitative interview and secondary data and comparison	n/a

	1. More cohesive collaboration and knowledge networks.	Cohesion Measures	-	n/a
	2. Locally anchored institutions (especially cooperatives) as both gatekeepers of knowledge and policy advocates	Centrality Measures	-	n/a
	3. More trust and collaboration around key resilience topics among local firms	Network Strength Measures & Cluster Governance Questions	-	n/a
	H6: More resilient clusters will have more open knowledge and collaboration networks (akin to bridging capital).	-	Quantitative comparison of outcomes, Qualitative interview and secondary data and comparison	-
	1. More and stronger links to external actors in the coffee GVC	Comparison of Links by Institution Type and Hubs	-	n/a
	2. More collaboration and trust with publically oriented institutions (e.g. Government, Educational, and NGOs)	Cluster Governance Questions	-	n/a
	H7: Social capital within an industry is driven by both local variation, and national institutional context	National Level Comparisons of Cluster Governance and Network Strength Measures	Qualitative interview and secondary data and comparison	n/a
Agglomeration	**H8:** Resilient areas will have better access to labor pools and transportation networks.	n/a	n/a	Distance Measures to Collection Points & Rural Population
	H9: Resilient areas will benefit from the industrialization economies provided by greater concentration of industry infrastructure and intermediary organizations.	n/a	Qualitative interview and secondary data and comparison	Number of Mills Purchasing in District

Furthermore, it was not possible to make a Low-High Cooperative comparison in Chiapas, because I could not identify climatically similar areas without a significant cooperative presence, but the state's cultural diversity allowed for comparing primarily indigenous and mestizo clusters to understand how this variation impacts their relationship with the GVC in an otherwise similar institutional context. This forced me to consider and to develop Hypothesis 4. An examination of the adaptive efficiency model in an area without such diversity would have easily overlooked culture as an institutional structuring element of adaptation.

Table 4-3 Hypotheses Addressed by Model Elements and Approach

Hypotheses by AE Model Elements		*Measures by Approach*		
		Social Network Analysis	**Case Studies**	**Regressions**
Institutional	**H1:** Clusters with strong cooperatives will be relatively more resilient	Cohesion and Centrality Measures	Documentation and comparison of role of local mills in adaptation through qualitative interview data and secondary sources	Percentage of Coffee Sold in a District that is Sold to Cooperatives
	H2: Cluster resilience will correspond to areas whose institutions encourage value chain upgrading	n/a	Documentation and comparison of innovation through qualitative interview data and secondary sources	n/a
	H3: Communal land tenure will lead to lower levels of on-farm investment and upgrading in the absence of strong public mechanisms to support farmers. These differences will primarily manifest themselves at the national level.	n/a	Comparison of Mexico and Costa Rica Outcomes	n/a
	H4: Clusters where producers are primarily from historically marginalized indigenous cultures will have weaker networks with external actors within public institutions and the coffee value chain . These barriers will affect resilience.	n/a	Quantitative comparison of outcomes, Qualitative interview and secondary data and comparison with Chiapas cases	n/a
Relational	**H5:** Cluster resilience will correspond to stronger social networks and social capital within the cluster (akin to bonding capital).	-	Quantitative comparison of outcomes, Qualitative interview and secondary data and comparison	n/a

	1. More cohesive collaboration and knowledge networks.	Cohesion Measures	-	n/a
	2. Locally anchored institutions (especially cooperatives) as both gatekeepers of knowledge and policy advocates	Centrality Measures	-	n/a
	3. More trust and collaboration around key resilience topics among local firms	Network Strength Measures & Cluster Governance Questions	-	n/a
	H6: More resilient clusters will have more open knowledge and collaboration networks (akin to bridging capital).	-	Quantitative comparison of outcomes, Qualitative interview and secondary data and comparison	-
	1. More and stronger links to external actors in the coffee GVC	Comparison of Links by Institution Type and Hubs	-	n/a
	2. More collaboration and trust with publically oriented institutions (e.g. Government, Educational, and NGOs)	Cluster Governance Questions	-	n/a
	H7: Social capital within an industry is driven by both local variation, and national institutional context	National Level Comparisons of Cluster Governance and Network Strength Measures	Qualitative interview and secondary data and comparison	n/a
Agglomeration	**H8:** Resilient areas will have better access to labor pools and transportation networks.	n/a	n/a	Distance Measures to Collection Points & Rural Population
	H9: Resilient areas will benefit from the industrialization economies provided by greater concentration of industry infrastructure and intermediary organizations.	n/a	Qualitative interview and secondary data and comparison	Number of Mills Purchasing in District

CHAPTER 6. COMPARING PERFORMANCE AND TRAJECTORIES OF MEXICO AND COSTA RICA AND COMPARATIVE CASES

Here I review a series of data regarding outcomes for the coffee industry in the regional clusters I have studied, and at the national level in Mexico and Costa Rica. These range from land use metrics, to data about price and yields. While none of these measures alone explains resilience, when taken as a whole they help build a stronger understanding of how the local industries adapted and coped with the dramatic changes in the coffee industry during the period of study. They create a yardstick of outcomes through which I can evaluate the relative importance of elements in the adaptive efficiency model.

6.1 Costa Rica v. Mexico

It is useful examine two key measures at the country level: yield and average prices. I will also examine national data on the coffee rust crisis, which has been a problem in Mexico. These country-level data emphasize the importance of national enabling environments and institutional contexts in determining industrial resilience. On the one hand, they are a reminder of the limitations of potential policy solutions at the cluster level, but they also are an aggregate of regional outcomes, which as I will show below, can be quite divergent even if they are largely influenced by factors at the country-level.

Costa Rica has been a leader in specialty coffee, and has cultivated a general reputation as a provider of quality, reliable, coffees. This is complemented by Costa Rica's reputation as a premier ecotourism destination, which helps attract purchasers to origin. Mexico has similar potential for cup quality in many regions, but problems during the INMECAFE period, including problems with supply chain management and milling practices, hurt its international reputation (CEFC 2001). One representative of a major US third wave roaster stated, that they do not buy from either country because the price is high in Costa Rica and Mexico has quality issues. The reputation of Mexican coffee has recovered, especially in organic and Fair Trade markets, but in general it still receives a price almost 15% below Costa Rican coffees on international markets (ACERCA 2016). See Table 6.1, which compares prices for highest quality (Strictly Hard Bean) and also prices for second highest quality (Hard Bean).

Table 6-1Costa Rica v. Mexico Price Comparison (sep, 2016, infoacerca.gob.mx)

	Types of High Quality Coffee by Country			
Metric	Costa Rica Strictly Hard Bean	High Quality Mexico Arabica	CR Hard Bean	Mexico Arabica
$/pound	198.30	169.90	179.30	160.90
Costa Rica to Mexico Ratio		116.72		111.44

Mexico's largely rustic coffee sector and Costa Rica's highly technified model, mean that the average yield for the two countries, even for small farmers, differs greatly. In part this is because Costa Rican farmers work within a monoculture system, whereas many Mexican farmers grow coffee as part of a larger semi-subsistence livelihood system. Costa Rica is well known for providing a strong extensionist system for technified coffee (Interview 2013), whereas most Mexican farmers are in the social sector and produce coffee in rustic, mixed-crop, systems.

Yields are an important indicator of resilience, because they dip in the face of long-term institutional and market problems, such as the coffee crisis and the dissolution of INMECAFE in Mexico. Costa Rican farms tend to have up to 5,000 plants per hectare, whereas the number is much lower in many parts of Mexico, especially the social sector, meaning that a hectare of coffee in Mexico produces much less coffee, though it may be rich in terms of its biodiversity and role in an agro-ecological system.

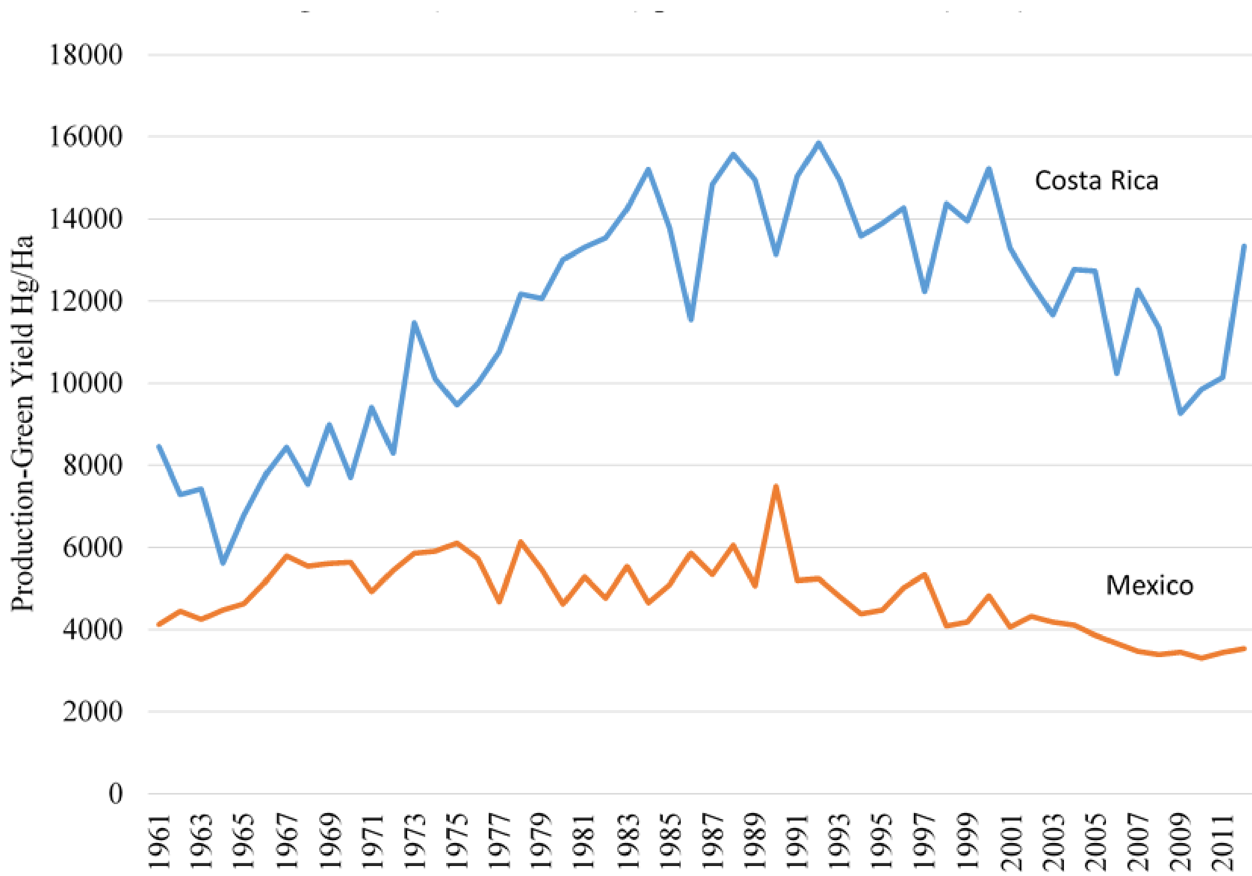

Figure 6-1Average Yield in Kilograms per HA 1961-2010 (FAO)

In Mexico the average yield fell by 25% to 7qq/HA in 2011 (SAGARPA 2011), whereas in Costa Rica the average yield is between 25 and 30 qq/HA. Fundamentally, this split is caused by Costa Rica's coffee industry enjoying the infrastructure and wealth to promote a system where farmers invest on average nearly $4,000 per hectare per year (ICAFE 2011) to obtain high yields, whereas in Mexico the vast majority of farmers have very little income, and farm using mainly local inputs and labor. In part, these divergent patterns of yield reflect the different models of coffee production in each country, but at a more superficial level they reflect the relative capacity for farmers to make investments in their parcels, which is a combination of individual-level financial capital, public sector programs to support the industry, and the effectiveness of the industry to self-finance production. All three of these elements are weaker in Mexico, where many farmers are on small parcels on communal land without access to capital, extensionism programs dissolved in the 1990s, and there is a major disconnect between agribusiness and social sector producers (Interviews 2014).

The differences between the systemic strength of Mexico and Costa Rica's coffee industries is not only apparent in general price differentials and yields. Mexican data about production up until 2013 (see case level comparisons) paint a generally optimistic vision of the coffee industry in Mexico, which might lead one to argue that these differentials reflect different models of resilience.[19] I argue that they show serious institutional problems in Mexico, and much progress in the industry came from the self-organized efforts of peasant organizations (Martinez 2007). These structural problems were constantly mentioned in interviews, and became manifest in the coffee rust outbreak starting in 2012-2013. In part, this is the usefulness of the qualitative case studies, which I explore in Chapter 8.

For example, in 2013, SAGARPA was declaring itself a "Pioneer in the Control of Roya with Innovation and Technology Transfer (SAGARPA 2013, 24 julio), and state representatives lauded the response (Notimex 2015, "Actividad cafetalera se recupera tras impacto de la roya" in economistsa.mx 04 08 2015). But these pronouncements were

[19] However, the reliability of these data is more questionable in Mexico than in Costa Rica because it is based on field estimates, whereas the CR data is from sales receipts.

belied by the fact that internal sources admitted publically that the agency did not have an accurate estimate of the extent of the problem (Enrquiez, 2014 Nov 2, El sol de Orizaba oem.com.mx).

By 2015 SAGARPA stated that it expected Roya to be a major problem for Veracruz, but less so for Chiapas. In early 2016, a leading Mexican newspaper declared the crisis in Mexico the worst in the last 40 years, with production having dropped 40% from 2014-2015 and in August the same newspaper declared it the worst crisis in 100 years, noting production could be 40% of 2000 levels (el financier.com.mx apr 24 and Aug 17).[20] By 2016, production in Mexican coffee production declined 70% off of its 1980s peaks (Belin 2016). The precipitous drop in production can be observed after 2013 in Figure 6-2Comparative Coffee Production in Costa Rica and Mexico, 2000 - 2016.

[20] I would note that while the crisis is undoubtedly severe, the 60% drop reflects a historically large harvest in 2000, and that coffee harvests are always cyclical.

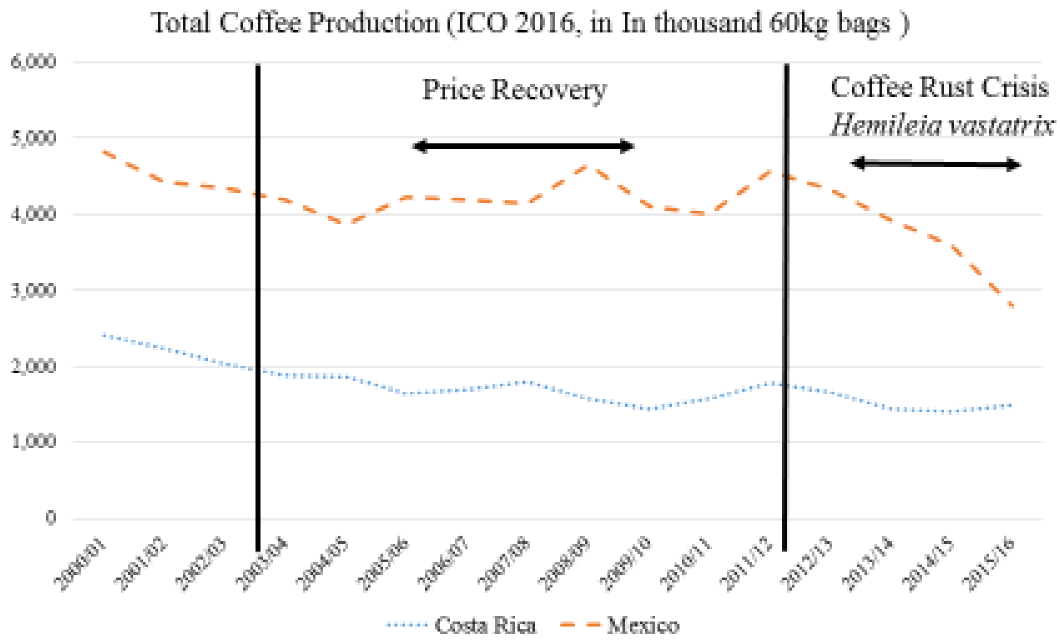

Figure 6-2Comparative Coffee Production in Costa Rica and Mexico, 2000 - 2016

Roya has been much less destructive in Costa Rica (Figure 6-2Comparative Coffee Production in Costa Rica and Mexico, 2000 - 2016). From the beginning, Costa Rica, had a much more comprehensive and organized response to the disease, and fewer underlying vulnerabilities because of its technified coffee varieties. The convening power of ICAFE, and higher levels of trust, meant that the Costa Rican industry was largely able to avoid the catastrophic consequences of coffee rust experienced by Mexican producers.

While the primary focus of this dissertation is not national, but rather to understand how the adaptive efficiency model explains resilience at the cluster level, I will nonetheless discuss how differentials in trust in public institutions and national level governance impact the enabling environment for clusters both in my case studies (see Chapter 8), and in my discussion of certain network measures (see Chapter 7).

The following data on adaptation to the coffee crisis in my cases helps to provide primary outcomes for resilience, which I supplement with qualitative data in Chapter 8, and which will allow me to explore the extent to which institutional variation and variations in knowledge networks explain resilience.

6.2 Costa Rica Performance

Data for Costa Rica's coffee industry is quite abundant. ICAFE registers every sale of coffee at the local level, and ICAFE, CATIE, and INEC, have conducted a series of census and land use surveys. Here, I compare outcome for my cases in terms of change in coffee land use, production in each cluster, and mills in each cluster. These three measures allow for comparison of changing industry structure, the total amount of farming that was retained, and the ability of the local industry to retain production levels during a period when, nationally, Costa Rica's production declined.

6.2.1 Land Use

Land use change measured by loss of hectares in production was predictably greater in the non-prime areas than the prime areas. High Cooperative cases in both pairings lost less of their baseline (2001) hectares planted in coffee than their matched Low Cooperative counterparts.

All areas of the Prime High Coop case were stable or had significant gains, meaning they lost less than 10% of their land use in coffee, or added more than 10% in new acreage. Conversely, all *cantones* (municipalities) in the Prime Low Coop case had moderate losses (from 10% to 25%) in their total coffee acreage between 2001 and 2012 (See Figure 6-3).

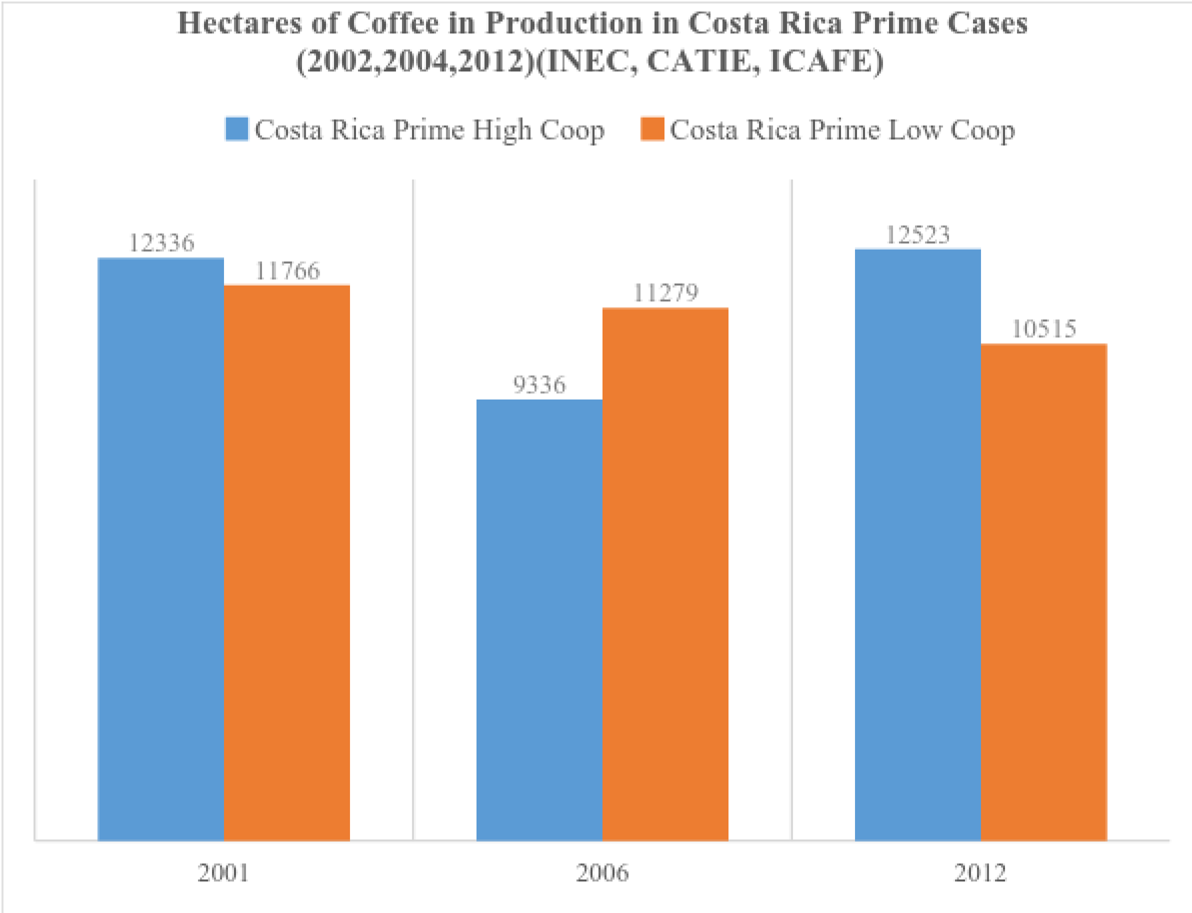

Figure 6-3 Hectares of Coffee in Production in Costa Rica Prime Cases

When seen from the perspective of absolute changes, the High Coop area lost considerably more coffee in the early stages of the coffee crisis than did the Low Coop case, but in the period between 2006 and 2012, during the recovery phase, this case bounced back, adding 34% of land back into production, while the Low Coop case continued with moderate declines. As a result, the High Cooperative case had 2% more hectares of coffee in production in 2012 than it did in 2001, while the Low Coop case had 11% less.

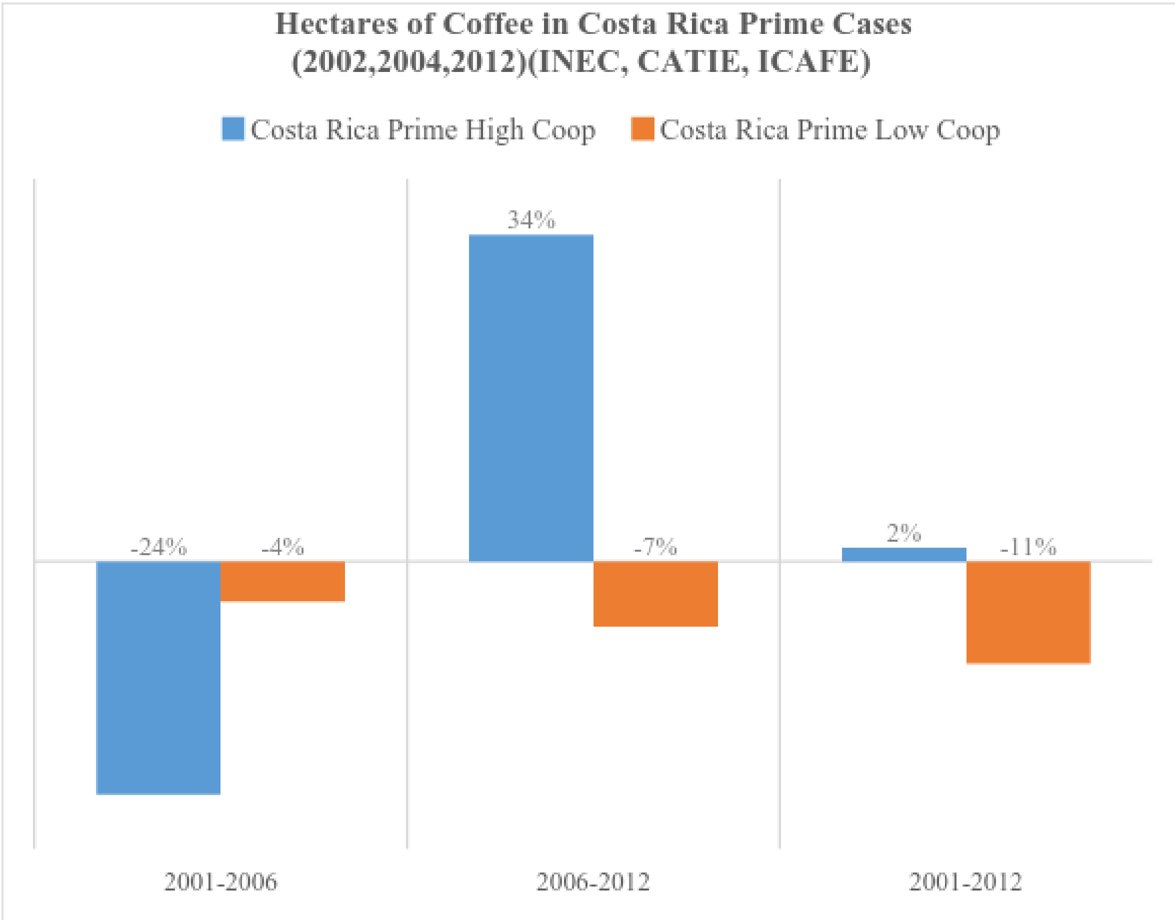

Figure 6-4 Percent Change in Coffee Land Use between 2001-2012 in Costa Rica Prime

In the Non-Prime cases, both lost considerable amounts of land in coffee cultivation (Figure 6-5). The difference in the absolute values with the Prime Cases is stark (Figure 6-4).

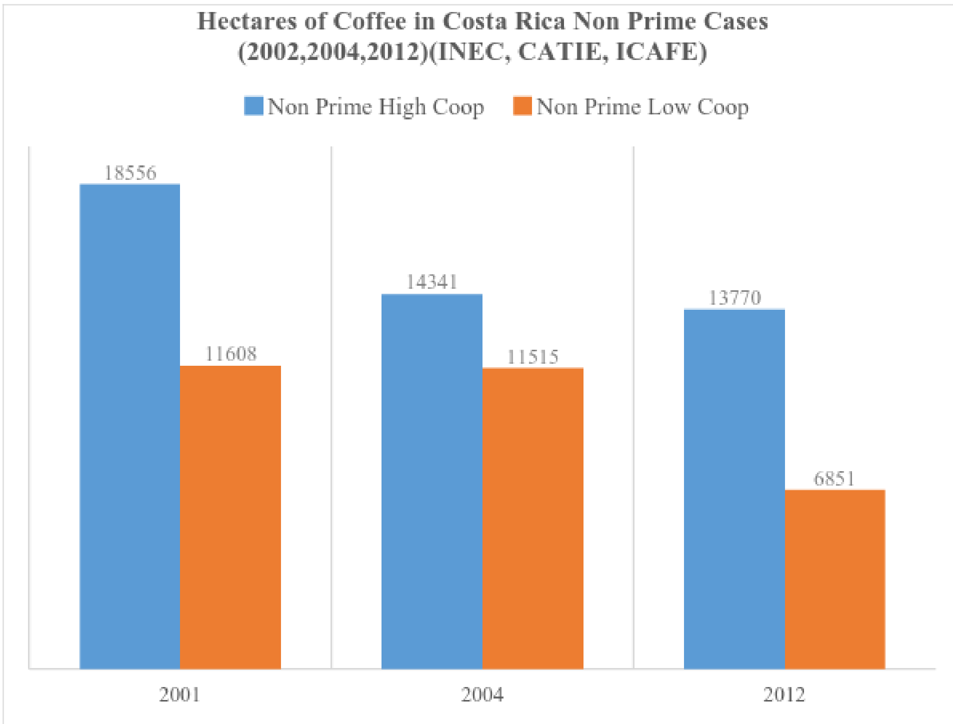

Figure 6-5 Hectares of Coffee in Production between 2001 and 2012 in Non-Prime Cases

In terms of absolute change in the Costa Rica Non-Prime cases, the Low Coop case lost 15% more coffee land than the High Coop case (Figure 6-6), but again, the timing of the losses contrasted, with the High Coop case losing 23% of its land in coffee in the first period between 2001 and 2004, during the height of the crisis, and the Low Cooperative case resisting more, but then dropping steeply in the long term to lose 40% of its land in coffee production during the 12 year period, versus only 26% in the High Coop case.

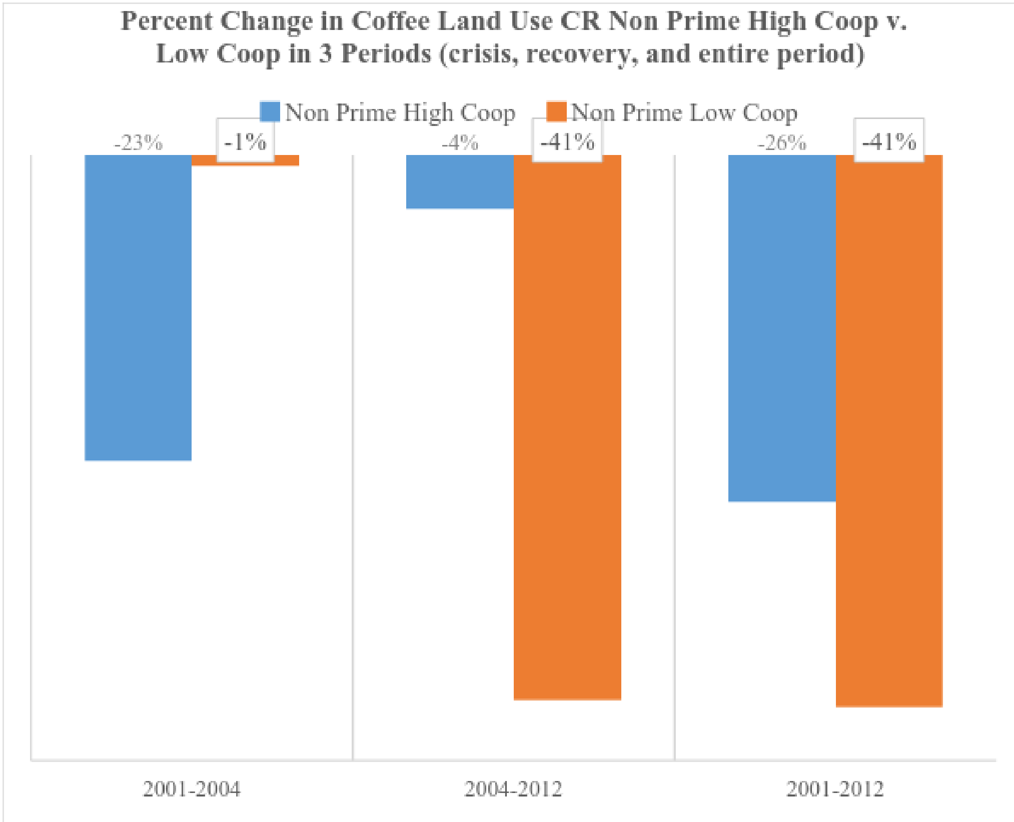

Figure 6-6 Percent Change in Coffee Land Use in Non-Prime CR Cases

Furthermore, while not depicted here, there were important differences in the Non-Prime cases, in that all of the districts (or sub-municipal units) in the Non-Prime Low Coop region lost coffee, while in the High Coop case there were districts that were either stable, or even gained hectares planted in coffee.

6.2.2 Production

When viewed by total volume of coffee produced, the two Low Coop cases lost more production output than their High Coop comparison cases, while the Prime cases retained more volume or output than the Non-Prime cases (Figure 6-7 and Figure 6-8). Unlike with land use, the volumes of coffee produced for the Prime cases were relatively stable after a steep drop in production around 2000. What is unclear is why the production changes do not mirror the land use changes. Part of this is likely due to cycles of productivity, but these should roughly mirror each other in these cases. It may be that the Low Coop case, which has excess milling capacity, started to receive coffee from outside the *cantones* due to the regional reputation. While this is illegal under ICAFE's regulations, key informants suggested that it was a practice that was hard to regulate both for mills, and for the government.

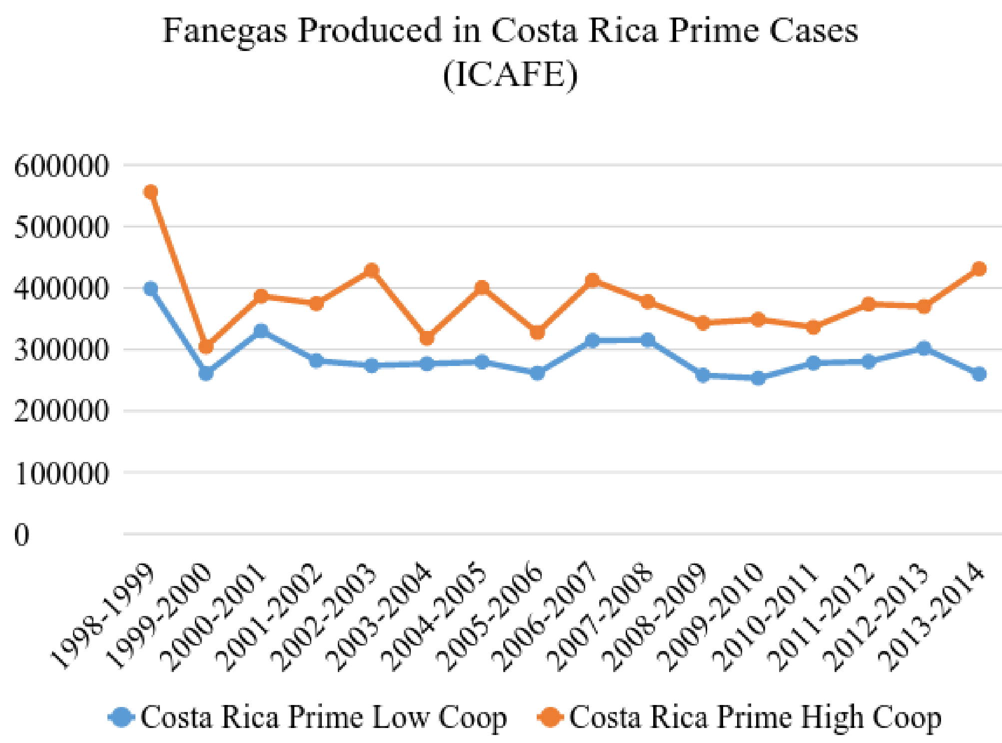

Figure 6-7 Fanegas (roughly 100 pound bags of green coffee) registered to Costa Rica Prime Cases

Both of the Non-Prime regions lost over half of their volume of coffee produced, while the Prime regions were much more resilient, producing 85% (Low Coop) and 95% (High Coop), respectively of the amount produced in 1999. However, while both areas started from similar baselines, suggesting that the Low Coop case started with higher yields, the High Coop case increased its production in the very beginning of the period, but after 2001 followed a very similar arc to the Low Coop case. Because the Non-Prime Low Coop case started with fewer hectares planted with coffee, and lost 15% more than the High Coop case, it appears that yields were more sensitive to the crisis in the Non-Prime High Coop cluster, and land use was more sensitive in the Non-Prime Low Coop cluster.

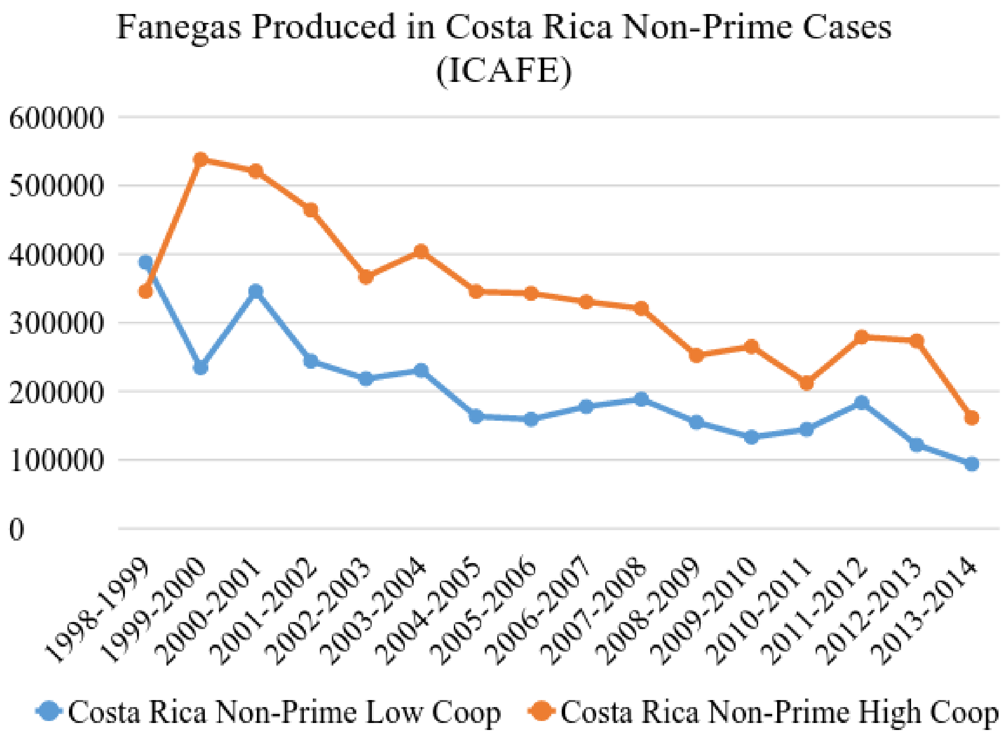

Figure 6-8 Changes in Production Levels in Non-Prime Cases (ICAFE 1998-2014

When we examine these trends in the same periods as the land use change, and the study period is divided into three sub-periods, it reveals that the High Cooperative cases actually lost more volume than the Low Cooperative cases in the initial period of the crisis (Figure 6-9). This mirrors land use. However, in the recovery period after prices improved (2010 - 2013), the Non-Prime Low Coop continued in steep decline, while the Non-Prime High Coop case gained some degree of stability. In the Prime region, the High Coop cluster not only recovered production but gained considerable volume, with the Low Coop case also recovering volume, despite continued loss of coffee land use.

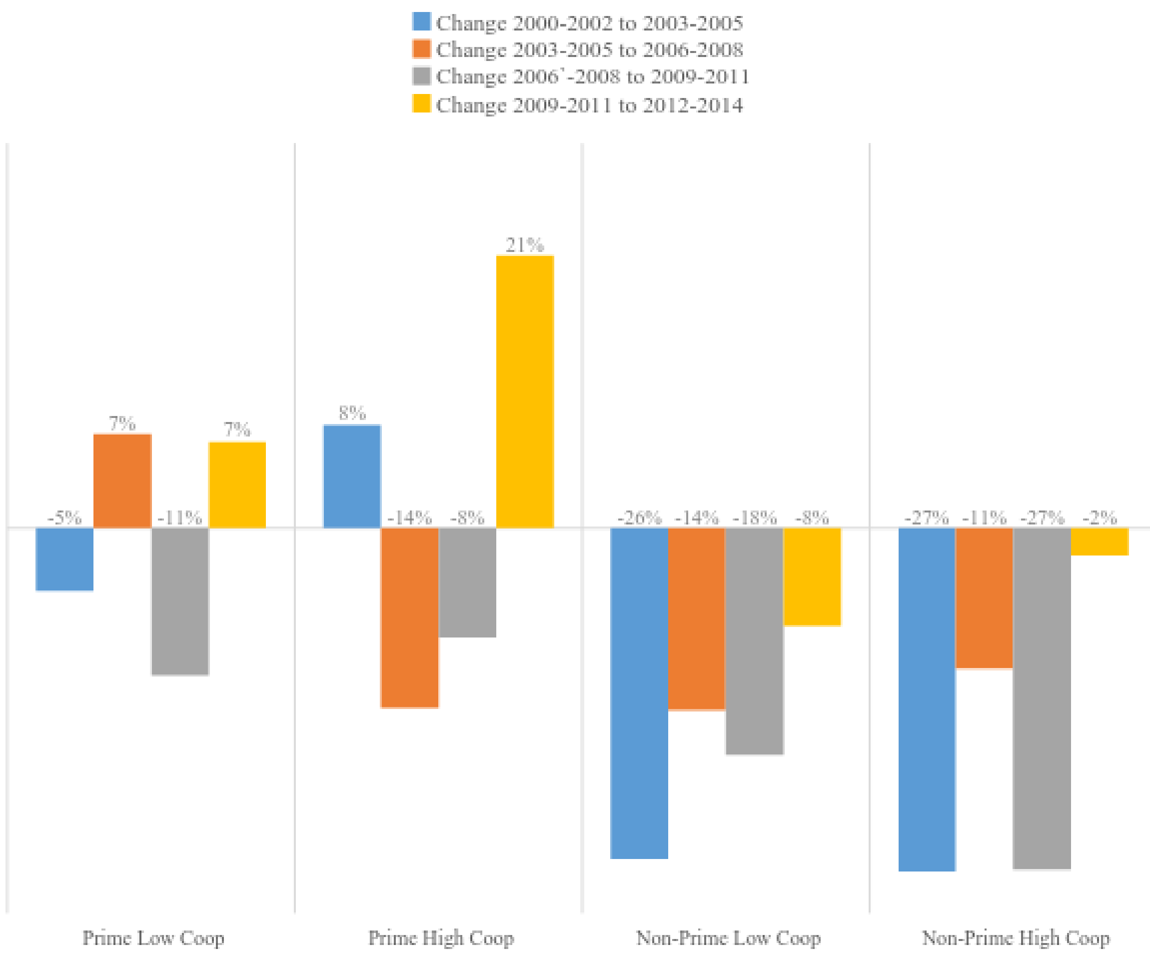

Figure 6-9 Four-period production changes (shock, reorganization, and recovery)(ICAFE)

6.2.3 Milling Infrastructure

Regarding the number of mills present in each cluster, [21] the general trend in Costa Rica is toward more, smaller mills. At the beginning of the period the main cooperative mills and large private mills bought much of the harvested coffee, but all of the large

[21] Here we focus entirely on mills located in the sub-cluster, not mills that purchase coffee in the sub-cluster but are located elsewhere. These external purchasing mills are very active in the two sub-clusters in the Prime pairing.

nationally owned private mills had failed by the mid-2000s, or were acquired by multinational exporting firms.

The Prime High Coop case started with very few mills located in the cluster in 1999 (6); this number crept up by 2005, and exploded between 2005 and 2012 to a total of 35 mills. This region now has a few large mills, either cooperatives or multinationals, but many newer mills on smaller scales have opened. These new mills process small volumes of coffee oriented towards differentiated specialty markets. In the Prime Low-Coop case a larger number of mills operated in 1999, but many had closed by 2005. New mills opened between 2005 and 2012 as in the High-Coop region, but this phenomenon was less pronounced (Figure 6-10).

Both of the Prime cases added more mills than the Non-Prime cases. The Non-Prime High Coop case also showed a marked upward trend between 1999 and 2012, after an initial dip in 2005, while the Non-Prime Low Coop case actually lost active mills, and represents the only case with fewer active mills located in the sub-cluster in 2012 than in 1999.

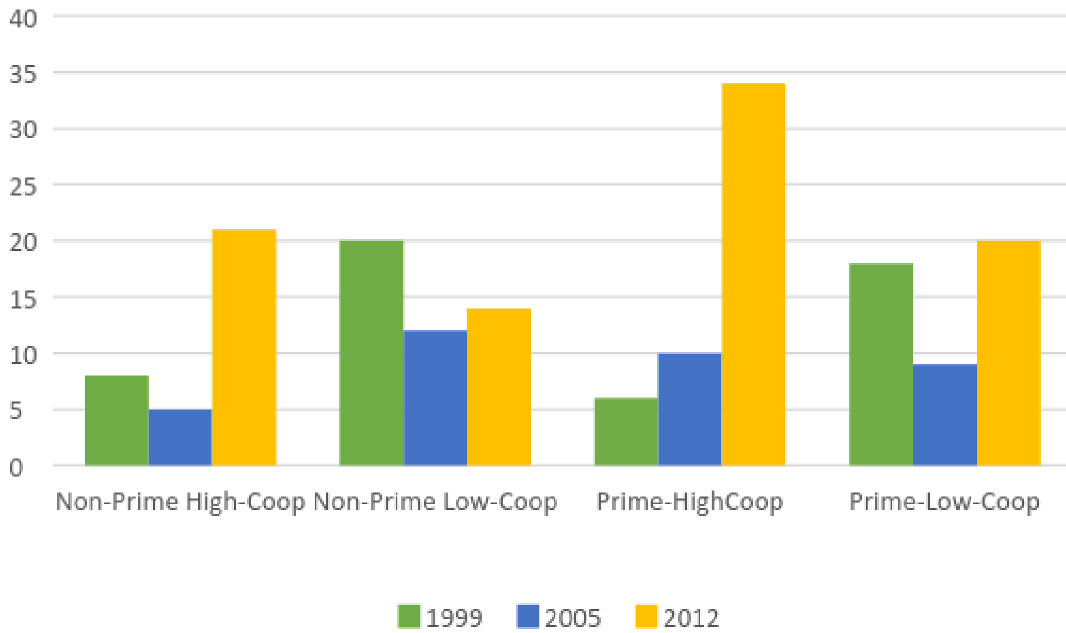

Figure 6-10 Change in Number of Active Mills 1999, 2005, 2012 by Study Region (Registering Sales with ICAFE)

6.3 Mexico Performance

In Mexico, SAGARPA collects data through its regional offices, and makes yearly estimates of harvests based on interviews with farmers in the region and participation in its agricultural programs. Here, I compare the cases based on these data, with the caveat that they are less precise than the Costa Rica data. Coffee industry governance in Mexico has been a challenge since the end of INMECAFE. These data have been criticized for not being sufficiently ground truthed. They are also linked to an opaque system of resource allocation (Belin 2016). There was a common belief among interviewees that these data were not entirely accurate. However, they are the best data available, and I use them as a gross measure of regional performance, and note that they may understate production losses, and overstate the number of active producers. Also, because the data is reported annually, but does not always change from year to year, I report the Mexico data in two periods only; and because the data sets in Mexico are from a single source, I report them by Chiapas and Veracruz, not by measure, as in Costa Rica. During this period the total production of Chiapas and Veracruz, dropped on average 5% and 1.5% annually. Chiapas reportedly dropped over 5% after the 2014/15 year, and Veracruz over 20% (FIRA 2015). The reasons for this, and the development and performance of each particular case will be discussed in the next section.

6.3.1 Veracruz

To measure land in coffee production, I aggregated SAGARPA data for the municipalities in each study area. Both of the Veracruz cases lost hectares planted in coffee. The Veracruz High Coop case lost more land in production compared with Veracruz Low Coop (Figure 6-11).

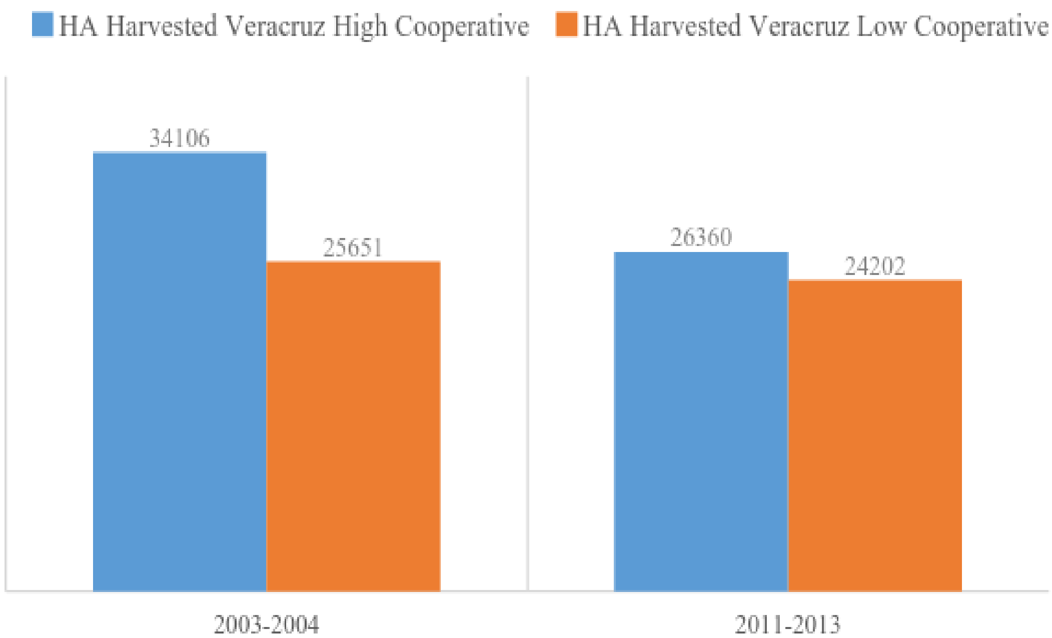

Figure 6-11 Hectares of Coffee in Production in Veracruz Cases (SAGARPA-SIAP)

However, despite having less land in production SAGARPA data indicate that Veracruz High Coop was producing more coffee at the end of the study period, while, Veracruz Low Coop had suffered a drop in production of nearly one half (see Figure 6-12).

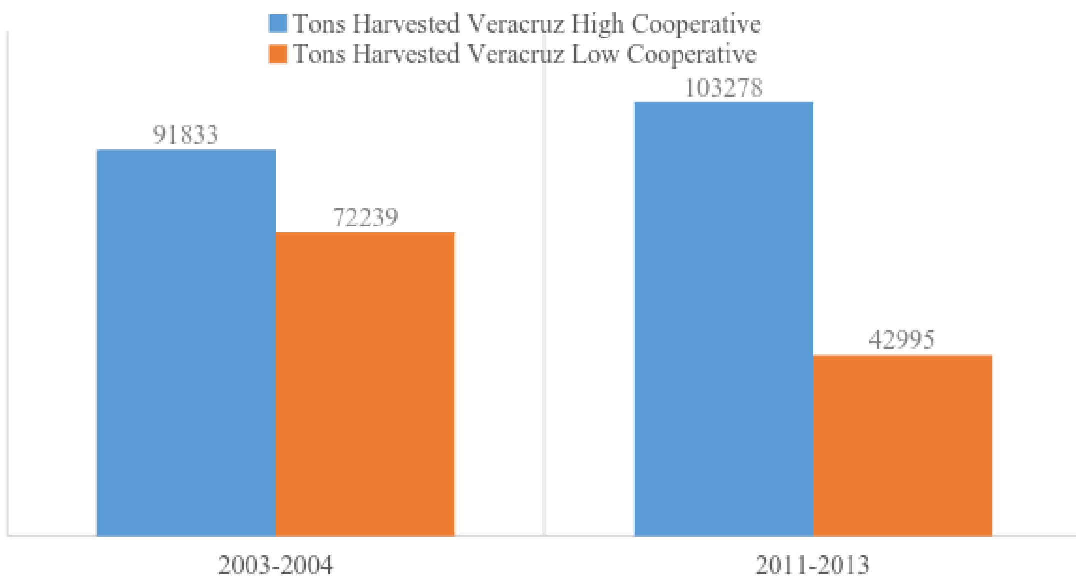

Figure 6-12 Tons of Coffee Beans Harvested in Veracruz Cases (SAGARPA-SIAP)

As a result of this trend, the data apparently indicate that yields grew in Veracruz High Coop and dropped in Veracruz Low Coop. (Figure 6-13)

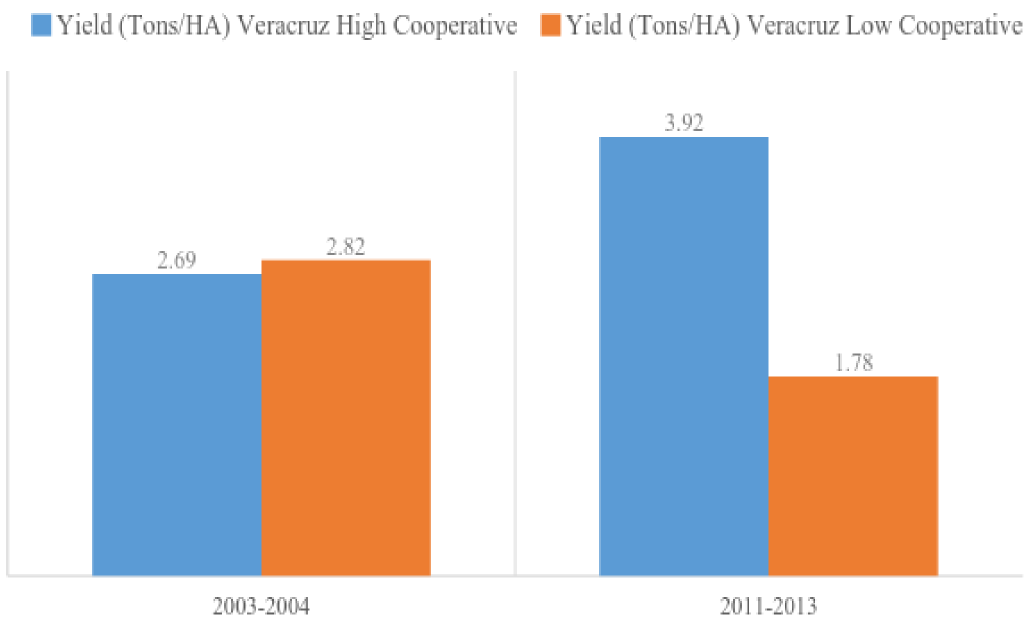

Figure 6-13 Changes in Yield in Veracruz Case (Tons/Ha) (SAGARPA-SIAP)

6.3.2 Chiapas

In Chiapas, both cases gained hectares in production (I start from a different base year because of issues with the data), but Chiapas Indigenous grew slightly faster (Figure 6-14).

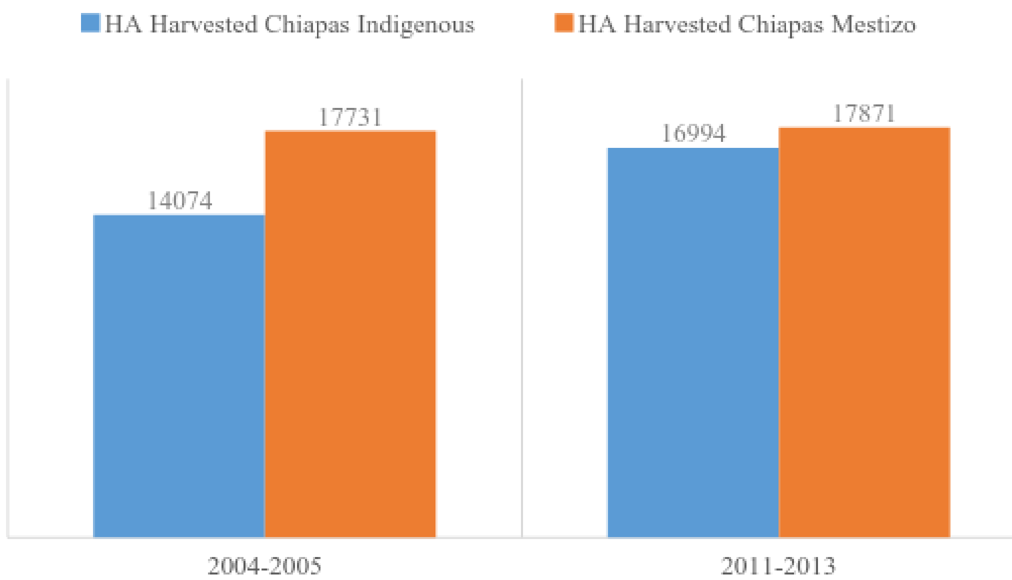

Figure 6-14 Hectares of Coffee in Production in Chiapas Cases (SAGARPA-SIAP)

The total amount of coffee harvested annually grew for the Chiapas Indigenous case, and was fairly stable for the Chiapas Mestizo case, albeit with a slight dip of less than 5 % (Figure 6-15)

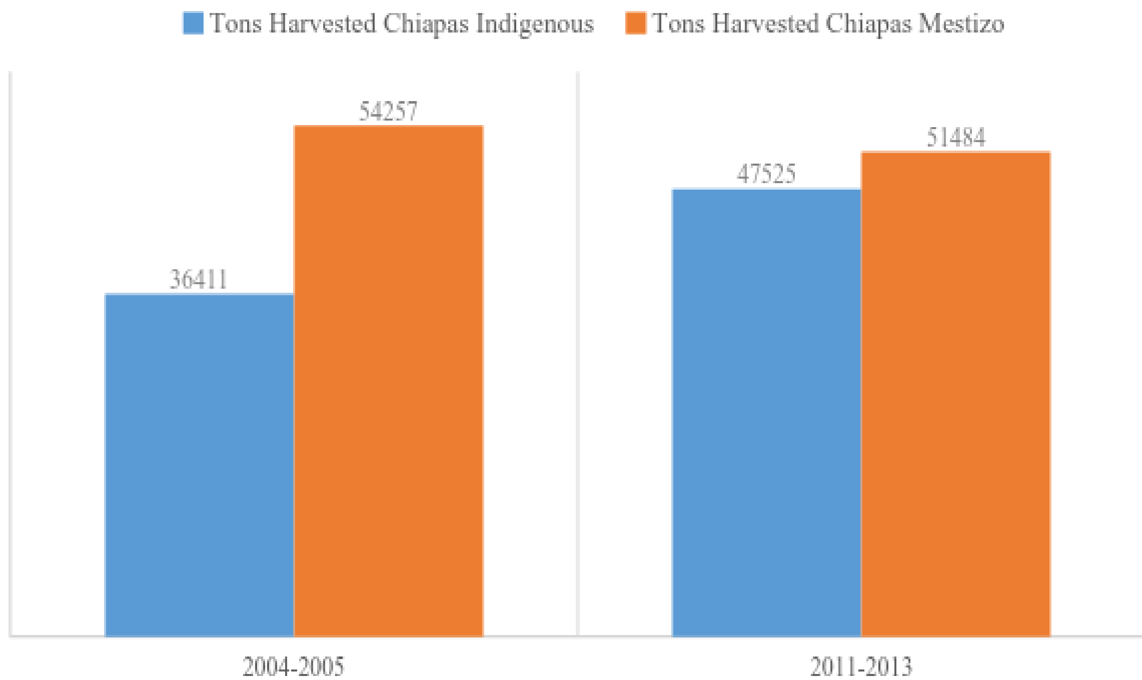

Figure 6-15 Tons of Coffee Harvested in Chiapas Cases (SAGARPA-SIAP)

Thus, Chiapas Indigenous and Chiapas Mestizo converged in terms of productivity, even though at the beginning of the study period Chiapas Mestizo reported much higher yields.

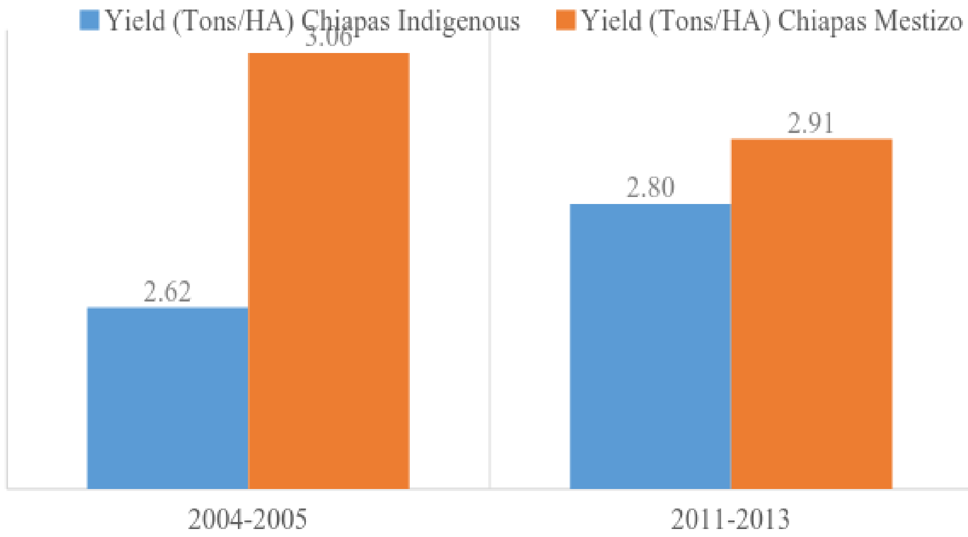

Figure 6-16 Changes in Annual Yields (Metric Tons/Ha) of Coffee in Chiapas Cases (SAGARPA-SIAP)

Unlike yields and productivity, the farm-gate price paid per ton in Chiapas Mestizo increased considerably relative to Chiapas Indigenous during the study period (Figure 6-17).

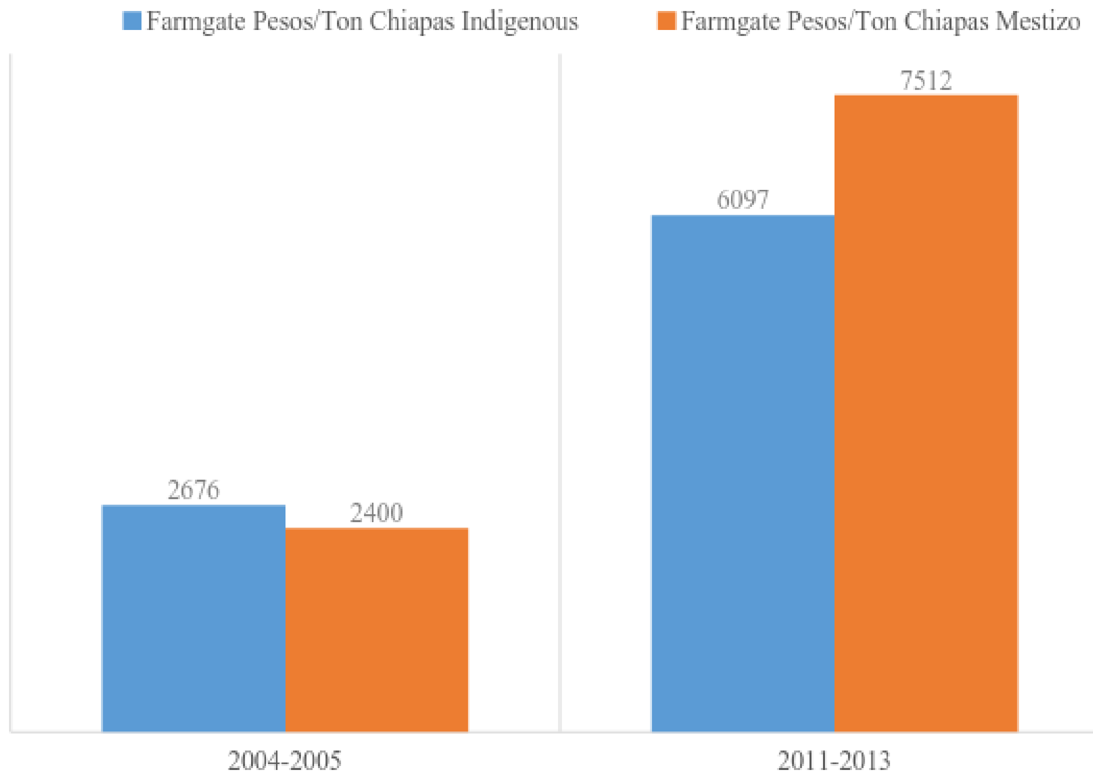

Figure 6-17 Prices in Mexican Pesos/Tons in Chiapas Cases (SAGARPA-SIAP)

6.4 Summary of Outcomes by Case

When comparing Mexico and Costa Rica as national cases, both countries saw their production of coffee decline from the 1990s, and settle into a new post-crisis equilibrium. This did not fundamentally change either country's relative market position compared to the other. Costa Rica maintained its strong reputation and relatively higher prices per volume of similar grades of coffee, and its high yield system. Despite this, Mexico in many ways showed similar levels of resilience despite the structural challenges related to the dismantling of the governance system build to support smallholder and ejido coffee farmers, but its low yields betrayed a structural problem which was exposed after 2013 due to the presence of coffee rust. Compared to Costa Rica, Mexico's coffee industry was much more vulnerable to coffee rust.

Table 6-2 Summary of Performance by Country

Country	Reputation & Price	Production Levels 2003-2013	Response to Roya	Yields
Costa Rica	Stronger	Stabilized Lower than 1990s	Stronger	Dipped Slightly from 1990s but Still Very High
Mexico	Weaker	Stabilized Lower than 1990s	Weaker	Very Low

At the case level (Table 6-3 Summary of Performance by Case) in Costa Rica, the starkest differences can be observed between the Prime and Non-Prime regions. That is, my selection criteria related to the adaptive efficiency model, High versus Low Cooperative, is a secondary explanation of each cluster's performance. However, land use loss was lower in each of the High Cooperative cases, which supports Hypothesis 1 that cooperatives promote resilience; these cases also saw greater levels of institution regeneration through the creation of new mills compared to their Low Cooperative pairings. Although this was largely dictated by Prime versus Non-Prime growing conditions, both of the High Cooperative pairings saw more new mills, even as older larger ones closed.

Table 6-3 Summary of Performance by Case

Country	Case	Production	Land Use	Yield	Number of Mills	Prices
Costa Rica	Prime High Coop	Steady	Moderate Decrease Followed by Moderate Increase	n/a	Strong Increase (in Micros)	n/a
	Prime Low Coop	Steady	Steady Moderate Decrease	n/a	Moderate Increase (in Micros)	n/a
	Non-Prime High Coop	Steady Declines	Strong Decrease followed by Stabilization	n/a	Increase in Micros, Loss of Large Mills	n/a
	Non-Prime Low Coop	Strong Declines	Moderate Decrease, Followed by Strong Decrease	n/a	Loss of Large Mills and Cooperatives	n/a
Mexico	Veracruz High Coop	Increase	Moderate Decrease	Increase	n/a	Increased (Comparatively Higher)
	Veracruz Low Coop	Moderate Decrease	Small Decrease	Decrease	n/a	Increased (Comparatively Lower)
	Chiapas Mestizo	Steady	Steady	Steady	n/a	Increased (Comparatively Higher)
	Chiapas Indigenous	Small Increase	Moderate Increase	Slight Increase	n/a	Increased (Comparatively Lower)

In Veracruz, the High Cooperative case lost more hectares than the Low Cooperative case, but both were moderate loses, and the High Cooperative case increased production and yields. This may reflect a fact that the Low Coop case lost land use before the study period, but the decrease in yields and production suggests that the industry in that area was relatively less resilient than in the High Cooperative case. Meanwhile, in Chiapas, both cases appear to have been resilient, although the Indigenous case started from a position of disadvantage with very low yields. Farmers in the Indigenous case appear to have increased their commitment to the industry, as can be seen in small increases in coffee hectares farmed, and reported production levels. The Mestizo case was steady throughout the period for most measures, except for prices. Both Chiapas cases increased their average prices, which may have been a function of markets and the move to organics, but the Mestizo case saw prices grow more, potentially reflecting more effective reputation building and value added activities around quality.

CHAPTER 7. SOCIAL NETWORK ANALYSIS AND CLUSTER GOVERNANCE ASSESSMENT

7.1 Overview

The adaptive efficiency model recognizes the importance of institutional and relational elements within the cluster. In this section I evaluate how knowledge networks and collaboration patterns vary within and across cases and apply this information to assess the potential for coffee cluster resilience. In particular, I evaluate whether regional institutional differences lead to structurally different social networks and determine the role that different firms play in the cluster. As a corollary, I examine how trust and collaboration varies between paired clusters and between Mexico and Costa Rica.

For this purpose, I surveyed representatives of coffee mills, which are the lead firms mediating knowledge and resources among producers, government, research institutions, and the global value chain. The survey included questions about the respondents' knowledge networks, and their perceptions of governance in the cluster (see Appendix). The goal of the knowledge network questions was to describe the structure of collaboration in each sub cluster (Group Cohesion) and to define the most important actors mediating these relationships (Actor Centrality). The goal of the cluster governance questions was to understand whether more resilient clusters reported more collaboration on key issues (more details below).

This chapter is organized in to four methodological sub-sections based on different analyses addressing knowledge networks and cluster governance. The first uses cohesion measures to answer whether more resilient clusters (see Chapter 6) have more cohesive, or structurally stronger, knowledge networks. The second uses centrality measures grouped by institution type to assess the relative importance of mills governed by different ownership and operational structures.

The third methodological sub-section of this chapter seeks to address questions of the strength and openness of local networks. To do this I compared the cases in terms of the reported number of contacts with different types of actors and the scores of frequency and trust reported in the networks of each firm.

In the fourth section, I analyze questions of Cluster Governance by asking a series of questions about the importance of topics related to collaboration on key topics, which I explain in greater detail below. The specific hypotheses to be tested through these methodologies are listed on Table 7-1.

Table 7-1 Specific hypotheses addressed on this chapter, with associated analytical measures

Hypotheses	Measures
H5: Cluster resilience will correspond to stronger social networks and social capital within the cluster (akin to bonding capital), reflected through:	
1. More cohesive collaboration and knowledge networks.	Knowledge Network Cohesion Measures
2. Locally anchored institutions (especially cooperatives) as both gatekeepers of knowledge and policy advocates.	Knowledge Network Centrality Measures
3. More trust and collaboration around key resilience topics among local firms.	Knowledge Network Strength Questions & Cluster Governance Questions
H6: More resilient clusters will have more open knowledge and collaboration networks (akin to bridging capital), such as:	Comparisons by Institution Type and Hubs
4. More and stronger links to external actors in the coffee GVC.	Knowledge Network Strength and Openness Measures by Institutional Type
5. More collaboration and trust with publically oriented institutions (e.g. Government, Educational, and NGOs).	Cluster Governance Questions
H7: Social capital within an industry is driven by both local variation, and national institutional context	Comparisons of Mex and CR
H4: Clusters where producers are primarily from historically marginalized indigenous cultures will have weaker networks with external actors within public institutions and the coffee value chain.	(See measures for H5 & H6)

7.2 Survey and Analysis Methods

7.2.1 Overview of Survey Sample and Data Collection

7.2.1.1 Survey Sample-Costa Rica

> Box 1. Hubs
>
> Two major types of management of mills are those which are operated through local management and those which are part of multi-cluster networks, managed from central offices that are outside of the cluster, which I refer to as Hubs

In Costa Rica, institutional variation among firms splits along two axes: ownership structure and firm size. I differentiate mills run by: 1) large cooperatives, started under government programs to promote cooperatives, 2) producers' associations, which are newer, smaller institutions (similar to cooperatives) formed by farmers after the coffee crisis, 3) multinational firms, and 4) privately owned companies. In addition, there is a group of multinational exporters (Box 1. "Hubs") who also interact with localities out of central offices clustered in the Central Valley.

I conducted a social network survey, aiming to interview all the different types of active mills in each area. Overall, I achieved between 75% and 90% coverage, surveying a higher percentage of larger mills. Gaps came primarily in the Prime High Coop case, which has dozens of micro mills of different levels of formality. Table 7-2 depicts the number of organizations that completed the social network survey in each region.

Table 7-2 Organizations Interviewed in Each Region in Costa Rica by Institution Type and Production Volume

	Interviewed	In Network	Coops	Producers' Associations	Multinational	Micro-mills	Private	Mean Production	Median Production
Non-Prime Low Coop	12	13	*1	1	1	4	6	17818.95	8515.96
Non-Prime High Coop	17	21	33	4	1	10	3	13012.38	556.28
Prime Low Coop	16	19	*0	4	2	8	5	14662.49	1539.11
Prime High Coop	*28	35	3	4	*1	22	12	9126.383	536.5125

*I did not include mills without a local presence in the networks. **In some cases I interviewed multiple actors from a single mill, but combined their answers.

Additionally, I interviewed at the central management offices of Hubs to control for the possibility that a cluster with few local connections could have much stronger out-connections within the value chain. Prior research has identified the operational structure of mills as a factor of their local embeddedness in knowledge networks (Giuliani and Bell 2005). To account for this, I compare both the cohesion and centrality network measures of each cluster with and without hubs, in order to understand variations in links to actors up the value chain as well as the way these relate to local networks.

7.2.1.2 Survey Sample-Mexico

In Mexico, I followed a similar approach. Because Mexico is structured differently, I do not differentiate between associations and cooperatives, nor did I include a separate category for micro mills,[22] but I added the category of Estate Farms (with on-farm mills).

In the Chiapas case-pairing, producers exclusively sell their coffee at the parchment (dried and semi-processed) stage. This means that Hubs, associated to cooperatives and multinationals, play a much more significant local role, the latter often purchasing coffee through semi-autonomous local agents (intermediary actors, often referred to as *coyotes*). This is also true to some extent in Veracruz, although much less so, because of a history of large receiving wet mills, many of which were at one time state-owned. In Veracruz, a significant number of farmers still sell coffee at the cherry stage to wet mills. Farmers also sell to local purchasing agents (*coyotes*), who are proxies for larger hubs. Identifying and interviewing these diffuse intermediaries was not possible in this project, but they are primarily purchasing agents and have not traditionally played an important role in providing support to farmers in the form of teaching, adaptation, or coordination. A few may provide support to farmers in obtaining certifications, but in general the intermediaries are exclusively purchasing agents.

Table 7-3 denotes the number of organizations interviewed by type. I achieved coverage through my interviews of approximately 50% to 80% of local mills, and a higher percentage of larger mills. It was difficult to create a roster of all organizations in a region because of the lack of any public list of mills in either state. In addition, many of the mills are on remote locations, especially on estates, which were difficult to physically access. In

[22] Only one area where I conducted interviews, Coatepec, had micro-mills, or small holder farms focusing primarily on selling their own coffee.

Veracruz, I also had interviews in which I spoke to representatives of Multinational Hubs and the local mills concurrently. This may threaten the validity of the local-Hub comparisons in those cases, but since I rely primarily on in-degree (or mills reporting another mill), this problem may be somewhat lessened.

Table 7-3 Organizations Interviewed in Each Region of Mexico by Institution Type

	Interviewed Local	Interviewed W/Hub	Multinational	Private	Cooperatives	In Network Local	In Network w/ Hubs
Chiapas Indigenous	14	18	3	0	15	17	28
Chiapas Mestizo	16	21	4	5	12	25	34
Veracruz Low Coop	13	15	2	12	1	29	35
Veracruz High Coop	18	19	2	10	7	23	30

7.2.2 Data Collection Method 1: Knowledge Network Questions

The survey and interview protocol that I conducted with mills in both Costa Rica and Mexico included a roster-based social network questionnaire in which mills were asked to select other local peers with whom they cooperated or exchanged knowledge, the frequency of these exchanges, and the level of trust they had in the organization. The survey protocol was built on the knowledge networks approach used by Morrison (2008), Giuliani and Bell (2005), and methods used by Baldassari (2013), but included significantly more questions about actors within the value chain (here I only focus on intra-cluster relationships) and a different set of multiplex relationships. Because of the length of interviews, I did not ask questions about friendship networks or take measures to explicitly distinguish between knowledge and information networks.

The Social Network Survey (see Appendix I) asked representatives of each mill to identify other local mills from an open-ended roster or to add additional contacts. For each mill I asked with whom they exchanged knowledge on technical, marketing, environmental, and local industry development matters.[23] Data collected from these surveys was used to construct socio-centric knowledge networks in each of the paired sub-clusters[24]. Additionally, for each tie, I asked the respondent to rate the frequency and trust of the relationship, which I discuss below.

7.2.2.1 Cohesion Measures for Analysis of Knowledge Network Questions

The results of the surveys were analyzed using UCINET 6 for Windows (64-bit) and NetDraw (Borgatti et al 2002). Not all reported relationships were reciprocal, and I could not interview every mill that was mentioned due to difficulties in establishing contact and time constraints, so the corresponding networks were not symmetric. I dealt with this issue by treating the corresponding networks as directed (from node A to B).

---

[23] The survey instrument also included social network questions about other actors in the coffee value chain (educational institutions, government, NGOs, exporters, buyers, and other non-local mills), and after conducting the survey each mill was interviewed about questions of local collaboration and innovation regarding the coffee market, economic challenges, and environmental issues.

[24] In Mexico, I made small changes to the questionnaire. Notably, I added two questions to differentiate between collaboration and communication networks. Because of time constraints during the interview process I did not differentiate between these networks regarding the knowledge sharing themes (technical, marketing, environmental, and cluster development), or trust and frequency networks.

First, I analyzed four measures of group cohesion (Borgatti et al 2013) that describe the larger structural components of interaction among mills in each cluster:

1. ***Average Degree***: average number of ties per node.

    More ties mean stronger network.

2. ***Density***: number of ties divided by the maximum number possible.

    Greater *density* implies a stronger network (normalizing for network size).

3. ***Centralization***: how much the network centers around single actor.

    Higher centralization scores imply the network is organized around a central actor, or in the case of fragmented network, several disconnected central actors.

4. ***Fragmentation***: proportion of pairs of nodes that are unreachable because of holes in the network

    Higher *fragmentation* scores mean that the network has a higher percentage of its nodes (actors) as isolates or in fragmented factions (inversely related to network cohesion).

Average *degree* gives a strong idea of the number of local peer connections each mill has but is biased towards larger networks, and *density* is a weighted average of *degree*. Both of these measures are useful because *density* gives a normalized view of the structure of the network, while average *degree* communicates the absolute opportunities for knowledge sharing and collaboration that may result from agglomeration factors in larger localized networks. Additionally, I examined centralization scores, which reflect the importance of central actors and may suggest vulnerability to losing these key actors, and *fragmentation*, which provides a measure of the portion of the network that is not relationally connected either directly, or through other nodes or actors.

I relate these network measures to the results discussed in Chapter 6 to address Hypothesis 5-1, that resilient clusters will have "more cohesive collaboration and knowledge networks." Furthermore, my case pairings explicitly address Hypothesis 5-2, that the role of Cooperatives and locally embedded institutions is important for local cluster networks. By comparing these measures in the cluster network both with and without Hubs, I will also address Hypothesis 4, which posits that indigenous communities face barriers to fair participation in the GVC for coffee.

7.2.2.2 Centrality Measures for Analysis of Knowledge Network Questions

In addition to measuring group cohesion, measures of centrality allowed me to examine the comparative role of cooperatives and producers' associations within the clusters. To do so I characterized each of the individual nodes in the network (Borgatti et al 2013) and also summed by actor category using the "group centrality" function in UCINET. If cohesion measures describe the structure of the overall network, centrality measures indicate the relative importance of individual nodes (in this case mills) in said network. In this case, I specifically use measures for the number of ties per mill, which I then average by mill-type and how relatively central these mills are with a measure of betweenness. Specifically, these measures are defined by Borgatti et al 2002 & 2013 as follows:

1. ***Degree* centrality:** Number of ties per actor.

    Actors with more ties are presumed to occupy more central, or important roles in the network.

    I also measure in-*degree* (relationships reported with the actor by other nodes) and out-*degree* (relationships reported by the actor with other nodes in the network).

2. ***Betweenness* centrality:** How frequently a node lies along geodesic pathways of other nodes in the network.

How many pathways between other nodes run through this actor, or node

Betweenness indicates a potential central brokerage position for knowledge and collaboration among other nodes, as it measures how frequently a node lies along relationship pathways of other nodes in the network.

The most important actors, in terms of knowledge dissemination, should be those with the highest in-degree centrality (Giuliani and Bell 2005), or in this case the mills or Hubs most cited by other mills in the survey.

Here I expect cooperative institutions to play more frequent brokerage roles as knowledge gatekeepers, defined by *betweenness* centrality; and also to be the most central institutions and with the most ties to other actors manifested through high *degree* centrality—in effect catalyzing the network. Specifically, I expect cooperatives in resilient clusters to have the highest degree and betweenness scores in accordance with Hypothesis 5-2 (seeTable 7-1).

7.2.2.3 Strength and Openness Measures for Analysis of Knowledge Networks Questions

As I first mentioned above, in the Social Network Survey I asked questions of respondents regarding the strength of mills' reported relationships in terms of trust and frequency with other actors grouped by function and by institutional category. The idea behind these questions was to parse out whether there are differences in the quantity and quality of relationships between the pairs clusters and how they relate with different types of institutional actors. This allows for a wider set of actors than the mill-centric analysis that I use with the cohesion and centrality measures noted above.

I used the values reported for trust and frequency for network ties to test for differences between my pairs and between Costa Rica and Mexico with respect to different institutional actor types: Cooperatives, Private National Firms, Private Multinational Firms, Educational Organizations, Government, and NGOs. In particular, I rated the frequency of contact and trust between 1) the mills of each cluster and relevant institutions (government, education, etc.), and 2) between the mills of the same cluster. Trust was measured on a five point Likert-type scale (1=Very Low, 2=Low, 3=Normal, 4=High 5=Very High), as was frequency of contacts for existing relationships (1=less than once a year, 2=annually, 3=several times a year, 4=monthly, and 5=weekly or greater). From these responses I calculated overall trust and frequency scores by actor-type and by sub-cluster. I also compared the clusters by summing the total number of contacts for each mill by institution type and averaging the total contacts by institution type in terms of the reported frequency and trust for each individual contact.

I used Mann-Whitney Tests to analyze differences in the pairings and between Costa Rica and Mexico. These tests address Hypothesis 5-3, that resilient clusters will have "[m]ore trust and collaboration around key resilience topics among local firms," and Hypotheses 6-1 and 6-2, both of which address the openness of the network, and Hypothesis 4, specifically in terms of the relationship with mills in the Chiapas Indigenous case with Multinational firms and Government.

Additionally, I aggregate the scores from the cases in Costa Rica and Mexico to make cross-country comparisons to understand whether issues of trust are principally explained by local or national differences, as stated in Hypothesis 7.

7.2.3 Data Collection Method 2: Cluster Governance Questions

Part of my survey queried perceptions of "cluster governance" adopted from Visser & De Langen (2006). These questions asked mill representatives to rate the importance they gave to, and questions of how effectively industry actors collaborated on five point Likert-type scales in terms of 1) environmental issues, 2) infrastructure, 3) local industry development, and 4) innovation. In addition, for the Mexico cases I added questions about response to rust disease (Phytosanitary) and regional reputation.

The number of respondents for the cluster perception questions differs slightly from the network responses, and were: Costa Rica Non-Prime Low Cooperative (12), Costa Rica Non-Prime High Cooperative (16), Costa Rica Prime Low Cooperative (13), Costa Rica Prime High Cooperative (28). In Mexico they were: Chiapas Indigenous (9), Chiapas Mestizo (12), Veracruz Low Coop (7), Veracruz High Coop (13).

As with the Knowledge Network Strength and Openness measures, I used Mann-Whitney Tests to analyze differences in the pairings and between Costa Rica and Mexico. I examine differences in patterns of collaboration between my pairings of clusters to answer Hypothesis 6-2, which posits that resilient clusters have "[m]ore collaboration and trust with publically oriented institutions (e.g. Government, Educational, and NGOs)." As in the previous section, I aggregate the scores from the cases in Costa Rica and Mexico to make cross-country comparisons in line with Hypothesis 7.

7.3 Results

7.3.1 Costa Rica Knowledge Network Questions: Cohesion

In Costa Rica, the High Coop cases display more cohesion, or structural integration. Average *degree* and *density* were higher in the High Coop cases than the Low Coop cases in both the Prime and Non-Prime regions (Table 7-4). This trend holds after including the multinational hubs in the analysis. Average *degree* (or average number of contacts) for the Prime Low Coop cluster was 1.68 (1.78 considering hubs) versus 4.60 (4.17 considering hubs) in the High Coop cluster. For the Non-Prime Low Coop case, average degree was 2.46 (2.63 considering hubs) versus 5.29 (5.14 considering hubs) in the High Coop cases. This is consistent with the larger sizes of the two High-Coop-Non-Prime clusters, but the *density* scores (number of ties over total potential number of ties), which controls for network size, are also higher for the High Coop cases (Prime: 0.13; 0.09 with hubs; Non-Prime: 0.26; 0.19 with hubs) than the Low Coop cases (Prime: 0.0.09; 0.08 with hubs; Non-Prime: 0.20; 0.15 with hubs).

The High-Coop cases differ in their *degree*s of centralization (Table 7-4). The Prime High-Coop case is more centralized around specific actors (0.31, 0.26 with hubs) than the Prime Low Coop case (0.25, 0.20 with hubs), but the Non-Prime High Coop case is less centralized (0.19 with or without hubs) than the Non-Prime Low Coop case (0.59, 0.37 with hubs).

This trend is also present in *fragmentation* scores (Table 7-4). The Prime High Coop network is considerably less fragmented (0.29, 0.47 with hubs) than the Prime Low

Coop network (0.72; 0.79 with hubs), but the scores are much closer for the Non-Prime cases (High Coop: 0.19; 0.39 with hubs; Low Coop: 0.22; 0.46 with hubs).

Table 7-4 Group Cohesion Measures in Costa Rica

	Prime				Non-Prime			
	Low Coop		High Coop		Low Coop		High Coop	
	Local	+Hubs	Local	+Hubs	Local	+Hubs	Local	+Hubs
Avg. Degree	1.68	1.78	4.60	4.17	2.46	2.63	5.29	5.14
Centralization	0.25	0.20	0.31	0.26	0.59	0.37	0.19	0.19
Density	0.09	0.08	0.13	0.09	0.20	0.15	0.26	0.19
Fragmentation	0.72	0.79	0.29	0.47	0.22	0.46	0.19	0.39

7.3.1 Mexico Knowledge Network Questions: Cohesion

In Mexico I observed broadly similar trends as in Costa Rica, but I divide the discussion by state because the selection criteria in Chiapas follows Indigenous versus Mestizo, and in Veracruz it is High Coop versus Low Coop (Table 7-5).

7.3.1.1.1 Chiapas

Chiapas Mestizo had greater average degree than Chiapas Indigenous (2.52, 1.75), slightly higher centralization (0.47, 0.32), virtually identical density (0.13, 0.12), and slightly higher fragmentation (0.54, 0.32). When Hubs are incorporated to the network, Chiapas Mestizo continues to report higher average degree (3.63, 1.93) and centralization

(0.43, 0.26), but increases in relative density (0.12, 0.07), and becomes slightly less fragmented (0.45, 0.50).

These results, when incorporating the Hubs, may indicate that Chiapas Mestizo has a stronger knowledge network integrated with Hubs as compared to Chiapas Indigenous. Both areas include local cooperatives and second level cooperatives, but the increase in average degree in the network comes primarily from greater contacts with multinationals, as I discuss below. Furthermore, Chiapas Mestizo has more mills and is much more geographically concentrated around a single town where many cooperatives operate. This may also explain the differences in their networks, although the density of ties is virtually identical for the local networks, indicating that they are not structurally different in terms of knowledge sharing at the local level.

7.3.1.1.2 Veracruz

Veracruz High Coop displayed higher average degree than Veracruz Low Coop (3.35, 1.69), centralization (0.17, 0.16), density (0.15, 0.06), and less fragmentation (0.46, 0.88). Uniformly, Veracruz High Coop had denser, less fragmented, and more centralized networks than Veracruz Low Coop, even when Hubs were added. With the addition of Hubs, Veracruz networks changed less than those of Chiapas, although I saw Veracruz High Coop’s measures degrading slightly: average degree dropped from 3.35 to 3.23, centralization from 0.17 to 0.13, density from 0.15 to 0.11, and fragmentation increased from 0.46 to 0.56.

Table 7-5 Results from Cohesion Measures in Mexico

	Chiapas				Veracruz			
	Indigenous		Mestizo		Low Coop		High Coop	
	Local	+Hubs	Local	+Hubs	Local	+Hubs	Local	+Hubs
Avg. Degree	1.75	1.93	2.52	3.63	1.69	1.81	3.35	3.23
Centralization	0.32	0.26	0.47	0.43	0.16	0.18	0.17	0.13
Density	0.12	0.07	0.13	0.12	0.06	0.05	0.15	0.11
Fragmentation	0.32	0.50	0.54	0.45	0.88	0.82	0.46	0.56

7.3.2 Costa Rica Knowledge Network Questions: Centrality

Cooperatives and Producers Associations are the most central actors in the knowledge networks of the High Cooperative cases, which I showed above to be denser and have more average in-degree ties. Table 7-6 and Table 7-7 below show that in the High Cooperative Regions, Cooperatives and Producers Associations have much higher average in-degree ties than the local offices of multinational firms, meaning the Cooperative and Producers Associations are disseminators of knowledge,. They also have the highest betweenness scores, suggesting that they play brokerage roles in terms of the relational network of the cluster. Micro mills in these clusters show a high number of ties but also significant knowledge seeking, seen via out-degree scores. They may have their own specific sub-networks, but they also rely on the larger local mills. Locally owned and administered Private Mills also were relatively central actors, and in the Non-Prime Low

Cooperative case, Private Mills were at the center of the local knowledge network. However, much of this has to do with the small size of this network.

What is clear is that relative to the volume of coffee that they process, the Multinational mills at the local level played a smaller role in the local knowledge network than similarly sized cooperatives, and less even than Producers Associations and smaller private mills. This pattern varied in only one case: the Non-Prime Low Cooperative Case. This was an instance in which the mill had strong commercial relationships with other mills because of certification programs and the overall knowledge network was weak.

Once Hubs were added, Multinational firms had a more important knowledge presence in all of the regions. In the Low Cooperative regions, the addition of Hubs resulted in multinational firms having in-degree scores that were similar to those of private mills, but still lower than those of cooperatives and producer’s associations. However, in all but one case their betweenness scores were low, suggesting that they do not play a brokerage role at the cluster level and instead seek out strategic relationships. The only case in which their betweenness score was high, suggesting a brokerage role, was the Prime Low Cooperative Area. This could either be the result of a greater focus on the region commercially, or because several of the private mills interviewed are estate producers with strong ties to management.

Table 7-6 Results from Centrality Measures in Non-Prime regions in Costa Rica

	Non-Prime Region											
	Low Coop						High Coop					
	Local			+Hubs			Local			+Hubs		
Actor Types	In	Out	Betw.	In	Out	Betw.	In	Out	Betw.	In	Out	Betw
Asoc.	1.00	2.00	0.50	1.00	n/a	0.00	6.25	6.50	29.10	5.60	n/a	17.29
Coops.	n/a	n/a	n/a	2.00	n/a	0.00	6.00	5.00	22.30	6.67	n/a	11.06
Micro	1.25	2.00	2.63	1.00	n/a	7.00	5.20	6.40	11.56	5.22	n/a	5.96
MultiN.	4.00	3.00	11.50	4.00	n/a	28.10	2.00		0.33	2.00	n/a	26.10
Private	4.20	3.60	19.50	3.86	n/a	16.76		4.60	2.40	4.40	n/a	24.83
Hub	n/a	n/a	n/a	3.66	n/a	0.34	n/a	n/a	n/a	4.67	n/a	1.30

Table 7-7 Results from Centrality Measures in Prime regions in Costa Rica

Actor Types	CR Prime Clusters											
	Low Coop						High Coop					
	Local			+Hubs			Local			+Hubs		
	In	Out	Betw.	In	Out	Betw.	In	Out	Betw.	In	Out	Betw
Asoc.	3.33	3.67	20.6	3.00	n/a	59.45	5.00	3.25	45.88	6.66	n/a	29.80
Coops.	n/a	n/a	n/a	n/a	n/a	n/a	9.33	4.66	99.93	10.00	n/a	76.44
Micro	1.22	1.78	2.13	1.00	n/a	10.29	3.87	5.00	25.22	4.19	n/a	30.42
MultiN.	3.00	1.00	5.50	2.5	n/a	22.15	2.00	3.00	4.00	2.50	n/a	19.27
Private	1.00	0.60	0.00	1.17	n/a	1.45	5.75	4.25	30.66	6.5	n/a	22.42
Hub	n/a	n/a	n/a	5.00	n/a	33.63	n/a	n/a	n/a	5.33	n/a	6.50

7.3.3 Mexico Knowledge Network Questions: Centrality

7.3.3.1 Chiapas

Chiapas Cases present a similar story generally to that of Costa Rica. The local offices of the Multinational firms were not central actors, neither when measured by in-degree in terms of knowledge dissemination, nor by betweenness. The local branches of Second tier (Hub) cooperatives were not central actors either. However, the Hub cooperatives were central to the knowledge networks of both Chiapas Mestizo and Chiapas Indigenous. In the Mestizo case, Multinational Hubs were very central actors with ties to both cooperatives and estates. This pattern was starkly different from that of Chiapas Indigenous, where Multinational Hubs had virtually no ties to cooperatives, and private estate mills or other private mills do not exist.

These cases show the presence of sub-groups in the cluster knowledge network, where there are, on the one hand, private estates that interact closely among themselves and with Multinational Hubs, and on the other, Cooperatives and Cooperative Hubs that interact with Multinational Hubs, but less so. As a result, the Chiapas Mestizo knowledge network is noticeably different once Hubs are added. This is less the case for Chiapas Indigenous, where the local firms have very few knowledge sharing and collaborative relationships with Multinationals, and because of this, the central actors in the network are the Cooperative Hubs, which bridge relationships with cluster-based cooperatives and Multinational Hubs (see Table 7-8).

Table 7-8 Result from Centrality Measures in Chiapas, Mexico

Actor Types	Indigenous						Mestizo					
	Local			+Hubs			Local			+Hubs		
	In	Out	Betw.	In	Out	Betw.	In	Out	Betw.	In	Out	Betw
Coop.	1.59	1.71	4.88	2.10	2.10	27.87	3.54	3.73	18.86	5.20	3.50	16.89
Coop Hub	n/a	n/a	n/a	2.25	1.75	59.17	n/a	n/a	n/a	5.33	10.67	77.08
Multi	1.00	0.00	0.00	n/a	n/a	n/a	0.66	1.33	0.50	1.00	2.00	1.30
Multi Hub	n/a	n/a	n/a	1.50	2.00	26.96	n/a	n/a	n/a	4.66	10.67	87.83
Private	n/a	n/a	n/a	n/a	n/a	n/a	0.00	n/a	0.00	1.00	1.00	0.00
Estate Farm	n/a	n/a	n/a	n/a	n/a	n/a	2.83	0.00	21.83	2.75	1.08	4.70

7.3.3.2 Veracruz

In Veracruz, the pattern was somewhat different than that of Chiapas, in part because there are many more Private National Mills, and Private Estates (Table 7-9). Also the Multinational Corporations have more active local offices because of certifications and the presence of estates and private mills with which they do business. The Veracruz networks reflect a more balanced distribution of roles in the knowledge networks between

Private national, Multinational, and cooperative mills. Unlike in the Costa Rica cases, or the Chiapas cases, Multinational Hubs in Veracruz were at the center of the knowledge networks, and while cooperatives do not appear to be playing the same central role they do in the other cases, the presence of a balanced mix of actors in Veracruz. What these numbers may overstate, because of sampling issues and imputation, is the role of multinationals at the local level.

Table 7-9 Result from Centrality Measures in Veracruz, Mexico

Actor Types	Low Coops						High Coops					
	Local			+Hubs			Local			+Hubs		
	In	Out	Betw.	In	Out	Betw.	In	Out	Betw.	In	Out	Betw
Coop	2.75	2.00	1.46	2.40	5.00	10.14	4.00	36.00	16.75	4.62	5.38	23.29
Coop-Hub	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	5.00	6.00	6.50
Multi	4.50	10.00	26.77	1.00	5.00	3.50	6.00	11.00	33.02	4.00	0.00	0.00
Multi Hub	n/a	n/a	n/a	3.67	21.00	28.95	n/a	n/a	n/a	5.17	3.66	18.65
Private	3.22	24.00	6.83	2.47	30.00	8.12	4.90	51.00	25.50	5.45	5.27	35.52
Estate	1.00	18.00	5.63	0.80	19.00	n/a	2.40	12.00	10.39	2.00	3.33	11.42

7.3.1 *Costa Rica Knowledge Network Questions: Strength and Openness*

At the case level, Costa Rica Prime High Cooperative had significantly more ties per mill than Costa Rica Prime Low Cooperative at the 0.10 significance level, but this pattern did not extend to the Non-Prime pairing.

By institution type, the High Coop region had higher numbers of contacts for every type of institutional class except for Private Multinationals. The differences were significant for private multinationals, in which the Low Coop case had higher contacts (p=0.01), and for private national firms, in which the High Coop case had higher contacts (p=0.02). I found no differences in terms of frequency of contact with institutions when comparing the two sub-clusters. In terms of trust, I only found significantly higher trust in NGOs in the Low Coop region (p=0.006).

In the Cost Rica Non-Prime area, the High Coop sub-cluster had a higher number of total contacts, but the difference was not significant. Looking at contacts by institution type, the High Coop had a higher number of contacts with Cooperatives and Private National firms, but only the number of contacts with cooperatives was significant (p<0.001). The Low Coop region had a higher number of contacts in Education, Government, NGO and Private Multinational, but none of these differences was significant. (Table 7-10). The frequency of contacts with the selected institutions (Table 7-11) was similar between High Coop and Low Coop Clusters. I found significant differences only in terms of trust, with a higher trust in Education institutions (p=0.001) and also in Private National firms (p=0.031) in the Low Coop Region.

Table 7-10 Number of contacts by institution type for mills in each sub-cluster in Costa Rica

Context	Cooperatives	Education	Government	NGO	Private Multinational	Private National	Grand Total
Costa Rica	Mean (SDEV)	Mean (SDEV)	Mean (SDEV)	Mean (SDEV)	Mean (SDEV)	Mean (SDEV)	Mean (SDEV)
NonPrime Low Coop	0.83(1.03)	1.17(0.94)	5.83(3.10)	2.75 (2.42)	2.33 (2.53)	4.75(2.22)	17.75 (8.90)
NonPrime High Coop	4.06(2.88)	0.701 (0.92)	5.56 (2.09)	1.94 (1.78)	1.82 (2.63)	6.18 (3.07)	20.29 (9.00)
Exact Sig. [2*(1-tailed Sig.)]	0.00***	0.180	0.913	0.471	0.647	0.303	0.499
Prime Low Coop	1.53 (1.41)	1 (1.51)	4.73 (2.74)	2 (1.89)	2.87 (1.81)	4.4 (4.29)	16.93 (9.42)
Prime High Coop	2.21 (1.89)	1.21(1.34)	5.1 (3.10)	2.9 (2.71)	1.43 (1.62)	7.7 (5.45)	20.96 (9.62)
Exact Sig. [2*tailed]	0.275	0.346	0.959	0.176	0.012**	0.024**	0.08*

p=*<0.10; **<0.05, ***<0.01

Table 7-11 Frequency of Contact and Trust between interviewed mills and actors within the coffee industry in Costa Rica

Context	Cooperatives		Education		Government		NGO		Private Multinational		Private National		Grand Total	
Costa Rica	Frequency	Trust	Frequency	Trust	Frequency	Trust	Frequency	Trust	Frequency	Trust	Frequency	Trust	Frequency	Trust
NonPrime Low Coop	3.25 (0.612)	4.20 (0.447)	2.05 (0.726)	4.46 (0.47)	2.83 (0.676)	3.94 (0.45)	4.26 (0.61)	3.15 (0.91)	3.44 (1.07)	4.15 (0.97)	3.28 (0.68)	4.22 (0.69)	3.08 (0.53)	4.05 (0.53)
NonPrime High Coop	3.26 (0.649)	3.90 (0.441)	2.04 (0.983)	3.29 (0.45)	2.97 (0.504)	4.02 (0.40)	4.23 (0.54)	3.3 (0.61)	3.93 (1.18)	4.02 (0.78)	3.42 (0.68)	3.95 (0.30)	3.27 (0.44)	3.97 (0.23)
Exact Sig. [2*(1-tailed Sig.)]	0.858	0.275	1	0.001***	0.586	0.879	0.407	0.973	0.36	0.657	0.487	0.031**	0.097	0.3
Prime Low Coop	3.57	4.08	3.04	4.61	3.25	3.87 (0.79)	2.83 (1.38)	4.46 (0.78)	3.08	4.05 (0.88)	3.02	4.34	3.13 (0.36)	4.19 (0.68)

	(0.57)	(0.78)	(0.90)	(0.95)	(0.71)				(0.84)		(0.66)	(0.81)		
Prime High Coop	3.16 (1.09)	3.91 (0.72)	2.54 (1.16)	4.16 (0.87)	3.06 (0.60)	3.75 (0.72)	3.12 (0.79)	3.46 (0.83)	3.07 (0.96)	4.11 (0.82)	3.22 (0.73)	4.20 (0.51)	3.08 (0.47)	4.00 (0.43)
Exact Sig. [2*(1-tailed Sig.)]	0.251	0.603	0.333	0.294	0.533	0.689	0.707	0.006***	0.918	0.683	0.323	0.499	0.63	0.237

p=*<0.10; **<0.05, ***<0.01

7.3.1 Mexico Knowledge Network Questions: Strength and Openness

7.3.1.1 Chiapas Indigenous/Chiapas Mestizo

Chiapas Mestizo had a higher number of contacts overall (p=0.085). There were no significant differences between sub-clusters in terms of frequency of contact with the different institutions (Table 7-12). Broadly, I found higher levels of trust in the Chiapas Mestizo cluster (p=0.009), and frequency at the 0.10 level (p=0.093). The differences in trust were not significant when evaluated by institution type, but the trend of higher trust in Chiapas Mestizo was consistent (Table 7-13).

7.3.1.2 Veracruz Low Coop/Veracruz High Coop

The Veracruz High Coop region had a higher number of contacts overall and for all of the institutions assessed, but none of these differences were significant. There was a significantly higher frequency of contacts with Cooperatives in the High Coop sub-cluster (p=0.01). There was a higher frequency of contact with Private Multinationals in the High Coop cluster, which was significant at the 0.10 level. Aside from this, there were no other significant differences between the High Coop and Low Coop regions in Veracruz in terms of frequency of contact and trust in the selected institutions.

Table 7-12 Number of contacts by institution type for mills in each sub-cluster in Mexico

Context	Cooperatives	Education	Government	NGO	Private Multinational	Private National	Grand Total
Mexico	Mean (SDEV)	Mean (SDEV)	Mean (SDEV)	Mean (SDEV)	Mean (SDEV)	Mean (SDEV)	Mean (SDEV)
Chiapas Indigenous	3 (2.42)	1 (1.47)	4.6 (3.54)	2.86 (2.74)	0.74 (1.38)	0.86 (0.95)	13.5 (9.60)
Chiapas Mestizo	4.13 (4.6)	1.25 (1.48)	5.56 (3.71)	5.69 (4.38)	1.69 (1.62)	3.50 (3.41)	24 (15.76)
Exact Sig. [2*(1-tailed Sig.)]	0.667	0.667	0.525	0.058*	0.064*	0.007***	0.085*
Veracruz Low Coop	1.23 (1.48)	1.62 (1.66)	3.15 (3.24)	3.15 (3.29)	1.85 (1.21)	6.00 (3.92)	17.31 (9.28)
Veracruz High Coop	2.80 (2.97)	2.39 (1.39)	3.73(3.00)	3.58 (2.29)	2.89 (3.40)	6.26 (4.36)	22.00 (8.50)
Exact Sig. [2*(1-tailed Sig.)]	0.182	0.147	0.520	0.270	0.970	1.00	0.254

p=*<0.10; **<0.05, ***<0.01

Table 7-13 Frequency of contact and trust between interviewed mills and actors within the coffee industry in Mexico

	Cooperatives		Education		Government		NGO		Private Multinational		Private National		Grand Total	
Mexico	Frequency	Trust	Frequency	Trust	Frequency	Trust	Frequency	Trust	Frequency	Trust	Frequency	Trust	Frequency	Trust
Chiapas Indigenous	3.10 (1.03)	3.33 (0.89)	2.57 (1.40)	3.00 (0.63)	2.93 (0.69)	3.07 (0.62)	2.54 (0.81)	3.56 (0.77)	2.72 (1.48)	3.25 (1.0)	2.75 (0.75)	4.08 (1.00)	2.87(0.68)	3.34(0.47)
Chiapas Mestizo	3.28 (0.82)	3.79 (0.67)	2.48 (0.78)	3.59 (0.93)	3.06 (0.53)	3.37 (0.61)	2.91 (0.80)	3.85 (0.67)	3.52 (1.12)	4.47 (0.77)	3.19 (0.79)	4.24 (0.72)	3.17(0.54)	3.90(0.55)
Exact Sig. [2*(1-tailed Sig.)]	0.65	0.198	0.918	0.328	0.494	0.347	0.244	0.809	0.22	0.09*	0.238	0.916	0.093	0.009***
Veracruz Low Coop	2.54 (0.59)	3.68 0.69)	2.50 (1.17)	4.19 (0.65)	2.88 (0.60)	3.24 (0.77)	2.78 (0.65)	3.61 (0.55)	2.84 (1.15)	3.65 (1.03)	4.17 (0.58)	3.57 (0.46)	3.84 (0.44)	3.84 (0.44)
Veracruz High Coop	3.55 (0.75)	4.13 (0.43))	2.65 (0.83)	3.86 (0.59)	2.72 (1.02)	3.18 (0.85)	2.98 (0.85)	3.68 (0.64)	3.64 (0.85)	3.85 (1.01)	4.12 (0.55)	3.57 (0.72)	3.85 (0.32)	3.85 (0.32)

Exact Sig. [2*(1-tailed Sig.)]	0.01*	0.056	0.751	0.288	0.672	0.792	0.525	0.767	0.063*	0.424	0.851	0.95	0.323	0.705

p=*<0.10; **<0.05, ***<0.01

7.3.1 Mexico v. Costa Rica Knowledge Network Questions: Strength and Openness

More than in the case-by-case variations, a clear trend emerged in terms of trust between Costa Rica and Mexico, where the former had significantly higher scores for its relationships with the government, NGOs, educational institutions, and overall. This suggests that the largest qualitative difference in terms of national variations in cluster openness vary on the issue of trust with public entities.

Costa Rica had a significantly higher number of contacts with Government (p=0.048) and Private National firms (p=0.003), while Mexico had a higher number of contacts with NGOs (p=0.011) and educational institutions (p=0.038) (See Table 7-14), Number of contacts by institution type for mills in Mexico and Costa Rica). Frequency of contacts was not different between the countries, but there were consistent differences in terms of trust. Costa Rica had significantly higher trust in Education (p=0.037), Government (p<0.0001), and NGOs (p=0.034) (SeeTable 7-15).

Table 7-14 Number of contacts by institution type for mills in Mexico and Costa Rica

Context	Cooperatives	Education	Government	NGO	Private Multinational	Private National	Grand Total
Costa Rica	2.28 (2.24)	1.04 (1.61)	5.26 (2.79)	2.46 (2.31)	1.97 (2.12)	6.15 (4.44)	19.43 (9.28)
Mexico	2.85 (3.24)	1.23 (1.55)	4.29 (3.40)	3.87 (3.35)	1.87 (2.32)	4.27 (4.05)	19.61 (11.66)
Exact Sig. [2*(1-tailed Sig.)]	0.536	0.038**	0.048**	0.011**	0.559	0.003***	0.995

p=*<0.10; **<0.05, ***<0.01

Table 7-15 Frequency of contact and Trust between interviewed mills and actors within the coffee industry in Costa Rica and Mexico

	Coops.		Education		Government		NGO		Private Multinational		Private National		Grand Total	
Cross-Country	Frequency	Trust	Frequency	Trust	Frequency	Trust	Frequency	Trust	Frequency	Trust	Frequency	Trust	Frequency	Trust
Costa Rica	3.28 (0.84)	3.97 (0.63)	2.41 (1.04)	4.12 (0.84)	3.03 (0.61)	3.88 (0.62)	3.12 (0.89)	3.96 (0.83)	3.32 (1.02)	4.08 (0.83)	3.24 (0.69)	4.17 (0.58)	3.13 (0.45)	4.04 (0.47)
Mexico	3.18 (0.88)	3.74 (0.73)	2.57 (0.97)	3.74 (0.77)	2.89 (0.76)	3.20 (0.72)	2.83 (0.79)	3.68 (0.65)	3.27 (1.12)	3.89 (1.0)	3.34 (0.74)	4.16 (0.67	3.11 (0.55	3.74 (0.49)
Exact Sig	0.573	0.221	0.458	0.037**	0.341	0.00***	0.059*	0.034**	0.817	0.544	0.491	0.959	0.745	0.001***

p=*<0.10; **<0.05, ***<0.01

7.4 Cluster Governance Questions: Costa Rica

In the Non-Prime region of Costa Rica, High Coop and Low Coop clusters had similar levels of collaboration on all of the issues assessed (Table 7-16). The highest collaboration observed was in terms of Innovation (NP-Low Coop=3.083, NP-High Coop=3.31); all other topics were rated as having moderate-low levels of collaboration (range: 2.42-3.13). Issues were generally ranked as having moderate-high importance (range 3.66-4.44) by both sub-clusters, and there were no significant differences between the pairs. The collaboration trajectory in terms of these topics is either steady or decreasing in both regions (range: 1.12-1.50), with no statistically significant differences between the sub-clusters.

Similarly, the CR Prime Low Coop and High Coop respondents reported no differences in terms of their valuation of the importance of issues. Respondents ranked Environmental and Infrastructure issues with the highest levels of importance (range 4.61-4.20). I did find differences in terms of the degree of collaboration. First CR Prime High Coop areas reported higher Local Industry Development collaboration (p= 0.011) and an increasing trajectory towards local industry collaboration which was not observed in CR Prime Low Coop areas (p=0.008). There was a trend of higher environmental collaboration in the CR Prime High Coop. The current status of environmental collaboration was different among CR Prime High Coop and CR Prime Low Coop (p=0.097), and there was a significant difference in terms of an increasing trajectory for environmental collaboration (p=0.001) in High but not Low Coops. I also found differences in terms of collaboration for Innovation (p=0.03), which is not only higher in CR Prime High Coop, but respondents also reported a positive trajectory, which was not observed in the Low Coop region (p=0.03) ().

Table 7-16 Results from survey on I-importance, C-collaboration, and T-trajectory in terms of environmental, infrastructure, local industry and innovation in Costa Rica.

Context	Environmental			Local Industry Development			Infrastructure			Innovation		
Costa Rica	I	C	T	I	C	T	I	C	T	I	C	T
Non Prime Low Coop	4.16 (0.83)	2.75 (0.97)	1.67 (0.65)	3.67 (1.15)	2.42 (1.24)	1.25 (0.75)	3.75 (1.22)	2.58 (1.24)	1.33 (0.78)	3.92 (1.01)	3.08 (1.08)	1.50 (0.52)
Non Prime High Coop	4.31 (0.95)	2.75 (1.18)	1.13 (0.72)	4.31 (0.95)	2.94 (1.06)	1.47 (0.64)	4.19 (0.83)	2.94 (0.85)	1.39 (0.65)	4.44 (0.63)	3.31 (0.87)	1.27 (0.59)
p value	0.568	1	0.059	0.159	0.28	0.516	0.423	0.324	0.979	0.26	0.45	0.39
Prime Low Coop	4.54 (0.78)	2.46 (1.20)	1.15 (0.55)	4.14 (1.10)	2.00 (1.04)	1.14 (0.66)	4.61 (0.87)	2.61 (1.19)	1.42 (0.51)	3.57 (1.34)	2.38 (1.04)	1.15 (0.69)
Prime High Coop	4.43 (0.96)	3.07 (1.07)	2.14 (0.80)	4.04 (1.00)	3.00 (1.16)	1.96 (0.922)	4.20 (0.87)	3.20 (1.04)	1.92 (0.76)	4.19 (0.89)	3.22 (1.09)	2.00 (0.76)
p value	0.836	0.097	0.001	-	0.08	0.055	0.15	0.104	0.077	0.2	0.036	0.03

7.5 Cluster Governance Questions: Mexico

7.5.1 Chiapas Mestizo & Chiapas Indigenous

Chiapas Mestizo mills reported higher values for Importance, Collaboration and Trajectory for all topics relative to Chiapas Indigenous. The only significant difference was in terms of collaboration for Phytosanitary issues (p=0.027). In general both groups ranked Environmental, Phytosanitary, Reputation and Innovation issues as of high to very high importance (range 4.10–4.50) while Infrastructure and Local Industry Development were ranked as having moderate importance (range 3.11–3.43).

7.5.2 Veracruz High Coop & Veracruz Low Coop

Veracruz High Coop mills showed statistically significant difference regarding Infrastructure collaboration (p=0.03), and in terms of the importance given to Infrastructure (p=048). The two groups showed no other significant differences. The topic ranked as most important was Phytosanitary issues (Low Coop=4.40, High Coop=4.00).

7.6 Cluster Governance Questions: Mexico versus Costa Rica

Local Industry Development and Infrastructure were ranked as more important in Costa Rica than Mexico (p<0.001 for both measures). Collaboration in terms of infrastructure was higher in Costa Rica (p=0.01) and respondents suggested a trend for increasing collaboration in this topic in Costa Rica but not Mexico (p=0.001). Also higher in Costa Rica were Local Industry Development collaboration (p=0.081) and Innovation collaboration (p=0.067). The two countries showed similar trends in terms of Environmental collaboration, although this topic was ranked as relatively more important in Costa Rica (p=0.065).

Table 7-17 Results from survey on I-importance, C-collaboration, and T-trajectory in terms of Environmental, Infrastructure, Local Industry, Phytosanitary, Reputation and Innovation in Mexico.

Context	Environmental			Local Industry Development			Infrastructure			Phytosanitary			Reputation			Innovation		
Mexico	I	C	T	I	C	T	I	C	T	I	C	T	I	C	T	I	C	T
Chiapas Indigenous	4.33 (0.71)	2.56 (1.24)	1.12 (0.35)	3.11 (0.78)	2.11 (0.78)	1.12 (0.35)	3.43 (1.13)	2.37 (1.19)	1.17 (0.41)	4.14 (1.57)	2.00 (0.93)	1.5 (0.55)	4.17 (0.75)	2.43 (1.27)	0.80 (0.84)	4.43 (0.53)	2.38 (1.06)	1.17 (0.75)
Chiapas Mestizo	4.20 (0.79)	3.70 (0.48)	1.60 (0.70)	3.70 (1.06)	2.80 (1.14)	1.30 (0.67)	3.30 (1.06)	3.10 (1.20)	1.40 (0.70)	4.50 (0.97)	3.30 (1.06)	1.70 (0.67)	4.50 (0.71)	2.80 (0.79)	1.30 (0.83)	4.10 (1.29)	3.00 (1.33)	1.50 (0.71)
p value	0.78	0.053*	0.083*	0.278	0.211	0.515	0.813	0.237	0.428	0.887	0.027	0.428	0.428	0.536	0.31	0.887	0.408	0.428
Veracruz Low Coop	3.80 (1.30)	2.00 (1.00)	1.29 (0.95)	3.40 (1.52)	2.43 (0.79)	1.33 (0.82)	1.60 (1.34)	1.29 (0.49)	0.833 (0.41)	4.40 (0.89)	1.86 (0.90)	1.17 (0.75)	4.00 (0.89)	2.71 (1.11)	1.50 (0.55)	4.00 (1.55)	2.29 (1.25)	1.33 (0.82)
Veracruz High Coop	3.83 (1.19)	2.53 (0.52)	1.38 (0.65)	3.00 (0.95)	2.10 (0.86)	1.46 (0.52)	3.00 (1.04)	2.23 (0.93)	0.92 (0.64)	4.00 (1.35)	2.77 (0.83)	1.31 (0.75)	3.92 (0.90)	2.77 (1.09)	1.54 (0.52)	3.45 (0.82)	2.75 (0.87)	1.67 (0.49)
p value	0.959	0.115	1	0.721	0.311	0.898	0.048**	0.03**	0.831	0.721	0.056*	0.701	0.964	0.938	0.898	0.35	0.34	0.494

I=Importance; C=Collaboration; T=Trajectory; p=*<0.10; **<0.05, ***<0.01

Table 7-18 Results from survey on collaboration in terms of environmental, infrastructure, local industry and innovation in Costa Rica and Mexico.

	Environmental			Local Industry Development			Infrastructure			Innovation		
Context	I	C	T	I	C	T	I	C	T	I	C	T
Costa Rica	4.38 (0.89)	2.83 (1.10)	1.16 (0.83)	4.06 (1.03)	2.69 (1.17)	1.57 (0.840	4.20 (0.94)	2.91 (1.07)	1.60 (0.73)	4.07 (1.00)	3.06 (1.06)	1.60 (0.75)
Mexico	4.06 (0.97)	2.74 (0.98)	1.37 (0.67)	3.28 (1.02)	2.33 (0.92)	1.32 (0.57)	2.97 (1.20)	2.32 (1.13)	1.09 (0.60)	3.94 (1.08)	2.65 (1.10)	1.47 (0.65)
p value	0.065*	0.67	0.123	0.00***	0.081	0.127	0.00***	0.01**	0.001***	0.532	0.066*	0.704

I=Importance; C=Collaboration; T=Trajectory; p=*<0.10; **<0.05, ***<0.01

7.7 Discussion of Results

In order to frame these results in the context of the larger study, I will discuss them in light of each larger hypothesis and answer the sub-hypothesis in the text with specific reference to the result of the four methodological sub-sections mentioned above.

7.7.1 Hypothesis 5: Cluster resilience will correspond to stronger social networks and social capital within the cluster (akin to bonding capital).

In Chapter 6, I presented data suggesting that the High Cooperative cases in both Costa Rica and Mexico had been, to varying degrees, more resilient in responding to the coffee crisis in terms of a range of indicators. In this chapter, the Cluster Cohesion results indicate that the knowledge and collaboration networks in the High Coop cases offer both more absolute relationship opportunities, indicated by average *degree*, and relatively more relationship opportunities normalized by the size of the network, indicated by the *density*. Networks were also marginally less fragmented. These results support the proposition that resilience is associated with, "more cohesive collaboration and knowledge networks."

Likewise, the Centrality results suggest that locally anchored institutions, especially cooperatives, are the key firms in terms of knowledge and collaboration brokerage and dissemination. This pattern is stronger in Costa Rica than in Mexico.

In Costa Rica, the High Cooperative cases had more developed networks as a function of the presence of large cooperatives, but also because of the larger institutional mix. I observed that in the two high cooperative cases, cooperatives and associations have the highest measures of actor centrality. Accordingly, group cohesion measures were consistently higher for the High Coop clusters. Therefore, there seems to be an association between Cooperatives and local groups as lead actors and cluster network measures. One exception was the Non-Prime Low Cooperative case, in which larger private mills played a central role and had higher centralization measures than the High Coop counterpart. Nevertheless, this region showed lower scores for all other measures of network cohesion, which suggests that the type of actor that is central determines group cohesion, which is an important component of adaptive efficiency.

In general, the SNA scores in CR follow the same trends with or without Hubs, but in the case of the Non-Prime Low Coop case centralization is relatively higher than its High Coop pair when adding hubs, and in the case of density, the scores with hubs are much closer than in the local network. These hubs may therefore play a more important role in networks without strong local actors, filling part of the role that more-vertically integrated cooperatives fill locally, but from different locations. Notably, in all but one case, multinational hubs had higher in-degree scores than the average of their local branches, and in the one case in which the local branch was higher, it was Non-Prime Low Cooperative, where the local branch is the only large receiving mill in an important part of the cluster. Nevertheless, because these large companies are able to access resources and knowledge vertically through their own firms, and because management decisions are made at central offices, these firms may be less active in promoting cluster development. This lack of local investment may explain why regions that rely on them as central actors have less group cohesion and potentially lower resilience (e.g. lower production in CR Non-Prime-Low Coop).

In terms of the role of other central actors, Micro mills in CR have relatively low in-degree, but high total tie-numbers, for their size. A few micromills stand out as local stars, and are consulted frequently, but most are seekers in their relationships, and my data shows that they are not "go-to" organizations for knowledge and resources. Rather, they may magnify the network effects of larger territorially embedded mills with greater capacity for knowledge and resource development. Producers' organizations are somewhere in between, and their role appears to be more like that of a micromill or cooperative depending on size

In Mexico, the story is more complicated in terms of the role of locally embedded actors. Hubs, both cooperative and multinational, tend to play a more important role, which may be because of the lower yields of coffee cultivated that results in reduced capacity of many locally-owned Mexican mills. Veracruz more closely resembles Costa Rica in the sense that local wet mills play an important role, and the centralized infrastructure may create stronger local organizations.

The Veracruz High Coop case, has the highest cohesion of the cases in Mexico, but surprisingly cooperatives do not stand out as central actors, and the networks are relatively balanced in terms of the importance of different institutional types. One potential explanation for this is that the industry grew up around certain private organizations that have been able to persist and maintain important local roles. However, many of these organizations compete for clients, and while they report relationships with their peers, many do not see local collaboration as important for their business.

In general, cooperatives in this cluster collected less coffee than did private mills, contrasting with Costa Rica where they are lead market and cluster actors. However, this is also the region of Mexico where multinationals may invest the most in cluster development. One, for example, operates a Nespresso AAA program, which requires much more on-the-ground presence than in other areas.

In Veracruz, Low Coop, long-standing wealthy coffee families operate private mills, some of which are incorporated into regional coffee shop chains, and these mills tended to cluster together in cliques. In general, and many of the firms which operate mills that purchase coffee do so to augment their own production. They are thus more inward facing, as reflected by in-degree, and because of internal capacity and business connections, focused on vertical value chain relationships. The low group cohesion of this network may represent errors in data collection, but it may also reflect high reliance on multinationals or private mills through purchasing agents. Here the hub offices of multinational and national milling networks are the primary actors, which is both a function of proximity to their offices in the state capital, and the weakness of the local cluster. There are several smaller producers' organizations, but in general they do not have the capacity to promote cluster formation.

Similar to what I observed in Costa Rica, here the presence of territorially grounded firms, especially cooperatives, seem to relate to more robustly developed local cluster networks. This is to a great extent a function of the capacity of cooperatives, however, and where cooperatives themselves are economically weak, such as the Chiapas Indigenous, they do not promote greater cluster development. Chiapas Indigenous has many very small cooperatives, compared to Chiapas Mestizo. The size of these cooperatives, together with the fact that the farmers in the cluster, as members of marginalized minority groups, speak primarily indigenous dialects, may explain their lower capacity to establish relationships with orthodox value chain actors.

In terms of Multinational firms, they often have large numbers of ties, in part because they search for commercial opportunities, and because of memberships in large scale trade-groups. Their cluster presence varies drastically depending on whether they are sponsoring certification programs, in which case they may become more locally engaged. In the case of local engagement, they may play important roles in cluster development, a situation which I do not address here, but that may be the focus of future studies.

7.7.2 Hypothesis 6: More resilient clusters will have more open knowledge and collaboration networks (akin to bridging capital).

At the case level, in the Costa Rica Non-Prime examples, the only institutional category for the Network Strength and Openness measures with a significant difference in number of ties was Cooperatives, which follows from the absence of cooperatives in one of the cases. In the Prime cases, the larger size of the High Coop network meant that it had a larger number of ties, and in terms of institutional types the Low Coop case had more ties with Multinationals, and the High Coop case had more ties with Private National Firms. This follows from the importance of multinational hubs for the Prime Low Coop network, and, in the Prime High Coop cluster, reflects the large number of Micromills.

Regarding the trust and frequency measures, I did not observe differences in the Costa Rica cases, except for trust in educational institutions, which is possibly explained by the location of CATIE, an international agricultural research center, in Costa Rica Non-

Prime Low Cooperative, and the distance of Costa Rica Non-Prime High Cooperative from any large research institution with a significant agricultural outreach mission.

In Veracruz, none of the frequency or trust questions reflected significant differences, which may reflect historical similarities between the two clusters. These clusters are now more differentiated by trajectory and the composition of organizations than fundamental relational differences. In this sense, they broadly follow the pattern of Costa Rica. It may be that, barring large cultural differences (I will report the results for the Chiapas Mestizo and Chiapas Indigenous cases bellow while discussing H4), the nature and structure of most relationships in the coffee industry is not primarily driven by regional variation in firm ownership structure, but by larger scale differences at the national level.

Regarding the perceptions of cluster governance as a measure of collaboration, the Non-Prime cases in Costa Rica did not show important differences. On the other hand, High Coop and Low Coop cases in Prime areas show differences in terms of collaboration for Innovation, Environmental, and Industry Development, all of which are showing an increasing trajectory in the High Coop region. These differences appear to represent perceptions of the state of industry at the cluster level, but also ideas in the Low Coop area about a lack of organization and a central identity. The lower levels of innovation, reflect how this area has overall (but not at the organizational level) lagged in developing production for the specialty industry and providing new alternatives for producers. The environmental differences may be linked to the role of cooperatives in certification programs and the activity of NGOs on this topic. Something similar can be said about local industrial development perceptions, as in Costa Rica Prime High Coop a series of cluster development organizations have also emerged.

In the Chiapas cases, perceptions of cluster governance were not largely differentiated. Veracruz respondents did not report significant differences either. However, respondents in Chiapas Mestizo and Veracruz High Cooperative reported relatively higher collaboration on Phytosanitary Issues, in response to the coffee rust epidemic. Although I only asked this question in Mexico, I postulate that greater levels of perceived collaboration on this pressing issue in these two cases is a reflection of these clusters' institutional development versus their counter cases. In particular, the role of cooperatives in addressing this issue, and publicizing the problem seems to have been important for bringing government attention to the issue. Multinational firms have also played a central role, and it is in both of these clusters where they have the largest investments in farmer support and environmental certifications.

7.7.3 Hypothesis 4 Clusters where producers are primarily from historically marginalized indigenous cultures will have weaker networks with external actors within public institutions and the coffee value chain. These barriers will effect resilience.

The quantitative measures discussed previously in Chapter 6 do not provide clear evidence regarding the relative resilience of Chiapas Mestizo and Chiapas Indigenous cases. In fact, viewed from the standpoint of government-reported numbers, the indigenous case appeared to catch up. They did vary, however, in their network measures. This could be seen in the Cohesion and Centrality Measures, where the Chiapas Indigenous cluster had fewer ties per actor, and few direct ties to Mulintational Hubs.

Unlike in Veracruz, which I discuss above, the Chiapas Mestizo and Chiapas Indigenous cases both have many cooperatives, but these cooperatives have slightly different dynamics. Contrary to Chiapas Mestizo, in Chiapas Indigenous there are no private estate mills or purchasing mills besides multinationals. The other major difference between these networks is that the Chiapas Mestizo case becomes denser, and increases notably in average degree with the addition of Hubs, while the Chiapas Indigenous network does not. Density for Chiapas Mestizo and Chiapas Indigenous is similar in the local networks, but relationships between actors higher up the value chain appear more prevalent in Chiapas Mestizo, as least in terms of ties to exporting hubs. Many local cooperatives in Chiapas Indigenous, have important relationships with Fair Trade purchasers, but not multinationals. This suggests that the Indigenous Cluster is not closed to external collaboration, but rather that there is structural friction in terms of the roles played by multinationals, which purchase a preponderance of the coffee but do not actively participate in the cluster's relational network.

In Chiapas Mestizo, there is a stronger network in terms of density and centrality, based principally around a core of cooperatives with high volume capacity. There are also networks of estate farms who have strong network links and collaborate with multinationals closely. In these cases, cultural and historical factors seem to influence differences in the structure of these clusters and how they act with external actors. At the cluster level, the Chiapas cases did not vary in terms of Cluster Governance collaboration except for environmental governance, which probably reflects the presence of a biosphere reserve in Chiapas Mestizo that has brought considerable attention and resources for creating a more environmentally harmonious coffee industry.

In terms of the Network Strength and Openness questions, the Chiapas Mestizo reported more ties per mill, and more ties with Multinationals and Private National Mills. The number of ties may reflect the capacity of the organizations, and not the institutional differences in culture, but it is confirmed by differences in trust overall and with multinationals. This suggests that the clusters differ qualitatively in terms of the relationships that they have with external actors. Given that Chiapas Indigenous is a historically marginalized area, where some residents were quite recently in conflict with external actors, this result is predictable, and the result of organizations representing cultures that were historically not respected by powerful actors in the coffee value chain.

The lower level of trust in Chiapas Indigenous may also reflect issues of multinational purchasing agents making the process of organizing producers into cooperatives more difficult through selective price competition, with advantages in terms of access to resources from global networks and the need for producers to sell on the spot due to financial constraints. Since Multinationals have such low levels of local presence in the cluster's network, their presence as price competitors is seen negatively, especially in the historical context of the marginalization of indigenous producers within traditional business organizations.

7.7.4 Hypothesis 7: Social capital within an industry is driven by both local variation, and national institutional context

Differences in Strength and Openness measures were less pronounced between paired clusters than between countries. Large differences were observed between Costa Rica and Mexico, especially in terms of links to public oriented institutions and overall trust. Mexican respondents reported more contacts with educational institutions and NGOs, while Costa Rica had more contacts with government. In terms of trust, Costa Rican respondents reported higher trust across the board, and particularly in government, educational institutions, and NGOs. These findings are paradoxical because Mexican respondents reported more ties to NGOs and educational institutions than did Costa Rica. In the context of a weak central coffee governance structure and low trust in government, it may be that coffee actors in Mexico often interact with NGOs and educational institutions with greater expectations, and are disappointed by their limited capacity to support the industry as the national government once did.

Between the two countries, Costa Rican respondents reported higher values to most Cluster Governance questions, reporting higher collaboration for all categories. These scores may reflect the overall better health of the Costa Rica coffee industry and the existence of stronger cluster networks and institutions. In Mexico, perceptions that political forces were dragging down the industry and that each group played for itself were more widely held.

Higher environmental collaboration scores for Costa Rica may reflect Costa Rica's long term green marketing campaign and early environmental reforms in the industry. It is surprising that Mexico did not score higher in Environmental collaboration, given the prevalence of organic coffee in Mexico. This may be explained by the fact that organic farming in Mexico is as much the result of default conditions for many producers as it is an environmentally oriented initiative. Greater emphasis on local industry development and infrastructure in Costa Rica may also reflect that strong cooperatives anchor two of the clusters surveyed, which may have pro-social spillovers for cluster development.

7.8 Summary

Seen globally, in High Cooperative regions, locally anchored institutions showed higher centrality. These clusters also show greater measures of group cohesion. Therefore, in this sense, the type of institution type may play a role in determining the strength of the network and potential resilience. Clusters with weaker local institutions rely on multinationals, Hubs in particular. This may be problematic because multinationals may not have local interests in mind and invest comparatively less in regional infrastructure. There is a question of the direction of causality, and I cannot definitively answer with these network measures whether the lack of strong locally anchored institutions the result of a weak cluster, or the cause.

In terms of the cluster governance questions, there is less difference between pairs of clusters than between countries. In terms of frequency and trust of contacts with different actors, it seems that between paired clusters differences are only present in certain cases. However, I did see a consistent difference between the countries. These measures reflect distrust in government institutions in the Mexican coffee industry. NGOs and universities play a more prominent role in Mexico, but trust for these institutions was still lower than in Costa Rica, suggesting they are imperfect substitutes for stable governance structures.

CHAPTER 8. ANALYSIS OF COMPARATIVE CASE STUDIES

8.1 Framework for Qualitative Case Studies

Globally, coffee is a hierarchical product, where 4 or 5 large commodities firms control almost half of exports, and 5 large roasters buy over two thirds of the world harvest (Amecafe 2012 citing Davairon Paradox of Coffee). Most coffee is sold on futures contracts linked to the New York Commodities Exchange based on the per-pound price of 37,500 pound container shipments. Coffee is then given bonuses for quality, origin, and quality. In 2011 these contracts were at roughly $3.00 a pound, and by 2013 they were at $1.06, creating a confusing mix of signals at the local level about the economic value of coffee as an agricultural product. At $3.00 a pound, Latin American farmers are in the black, but at $1.06 they are well in the red. "The problem with coffee are the prices, these are becoming a form of modern slavery. You work, it pays badly, you have to take out credit, then prices don't cover costs, and in another part of the value chain they make a lot." (Mill Interview 2016).

With this pressure on producing regions in mind, this chapter asks, "how do components of the Adaptive Efficiency Model relate to adaptation?" Many of the adaptive changes I observed in the eight regions studied were aimed at improving the position of the industry, mills and farmers at the local level within this system, and in some cases breaking free from it, to the extent possible. However, doing so has required a mix of strategies that range from farming to market, and new forms of governance. Samper (2010) breaks down adaptations to the coffee crisis into 1) farmer strategies, 2) private and cooperative processing strategies, and 3) export firms, alliances, and vertical integration. Specifically, Costa Rican producers have experimented with changes in milling, such as vertical and horizontal integration, environmental certifications, and micro-mills (Sandí-Morales 2006) while policy in Costa Rica has pursued quality, environmental process improvements, and institutional innovation (Orozco and Diaz-Porras 2007). Mexico's changes have followed this pattern, but are harder to classify because of the disorganization of the sector following the collapse of IMECAFE (Perez-Akiaki and Echanove Huacuja 2005).

To some extent, what is described as institutional innovation in Costa Rica can be seen as a wider pattern of inter-institutional struggle, within which the agendas of different interest groups are defined by capacity to innovate. In Mexico, the formation of the Fair Trade Movement (Jaffee 2008) and emergence of Organic Coffee (Martinez 2007) were important GVC strategies executed at the local level around the social sector, and the contrasting emergence of larger commercial conglomerates (Perez Akiaki and Echanove Huacuja 2005).

Given this dissertation´s focus on mills and exporters as the primary actors, and clusters as my scale of interest, I do not fully explore adaptation at the farm level as do, for example Balbin 2015, Eakin et al 2012, or the full extent of intra-mill strategies to support farmers and incorporate knowledge as does Snyder (2016), or work focusing on internal firm strategies. Instead, I focus on how industry adapts through institutional and relational innovation. Specifically, I examine how national trends and adaptations in the value chain manifested themselves in the clusters I studied in the categories of upgrading, governance reorientation, and farmer support.

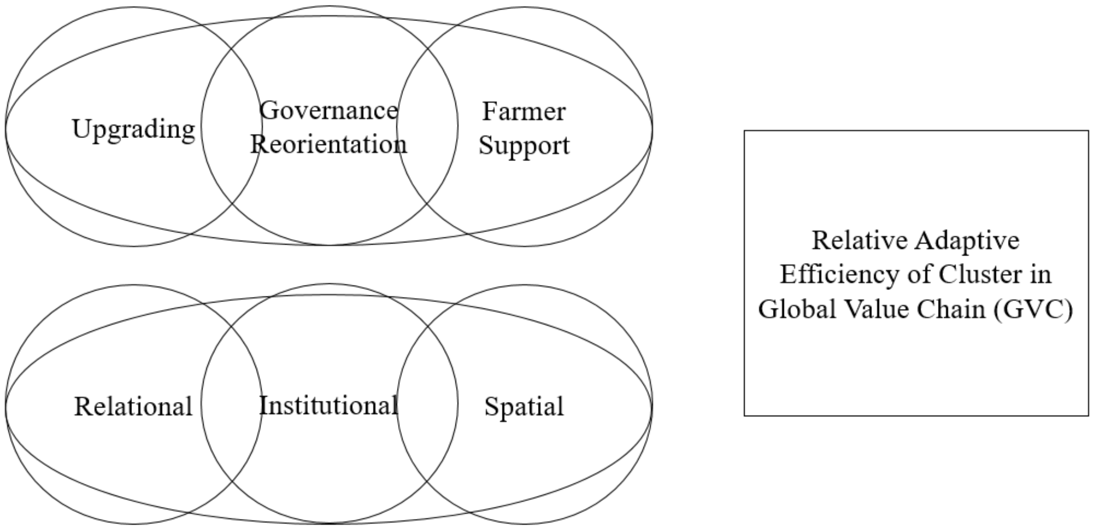

Figure 8-1 General Analytical Framework for Case Studies

This approach is based on broad categories outlined in previous research (e.g. Samper 2010), but also attempts to incorporate ideas of cluster governance (De Langen 2004), which I explain through the prism of my adaptive efficiency model. Where I hope to contribute in this section is with an understanding of comparative trends of adaptation in each of my pairings of cases, selected for their contrasting local enabling environments (Figure 8-1 General Analytical Framework for Case Studies).

This section uses a case study approach to describe coffee clusters in Costa Rica and Mexico. I compare paired cases in each country based on institutional, relational, and spatial elements of the adaptive efficiency model, and determine the role these factors play in determining adaptations such as upgrading, governance reorientation, and farmer support. I describe each case using information from semi structured interviews with coffee industry stakeholders in each region together with secondary data to provide context and a greater understanding of the larger case.

8.2 Data Collection & Analysis

To gather qualitative data, I interviewed representatives of mills, following a survey, and semi-structured questionnaire (see Appendix) about economic, environmental, and market challenges, as well as issues with collaboration, and how the interviewees compared their cluster with the larger national industry. For smaller organizations, I also asked about organizational history. These interviews focused on economic challenges for their region and firm, the impact of differentiation (or the specialty market) versus the commodity market, and environmental issues. Under each of these categories I asked questions about collaboration and relationships with other firms, and institutions such as the government. I also gleaned qualitative information on relationships from discussions during the quantitative survey, which in most cases I, or a field assistant, filled out during the interview process. The interview time included the network survey discussed in Chapter 7, and interviews and surveys together ranged from 40 minutes to over two hours.

In addition to the mills, or supply chain organizations, I interviewed other key informants, attempting to cover the important coffee related institutions in civil society and government. These interviews were mostly one-on-one, and I asked each interviewee a similar format of questions regarding environmental, market, and economic challenges, and questions about the coffee industry. I asked about the role of the interviewee's particular organization, and how they viewed the coffee industry, with a focus on the case study areas. Furthermore, I attended industry activities, when possible, in all of the cases, ranging from the roll-out of new organic standards in Mexico, to a Coffee Congress in Chiapas, to multiple academic talks and coffee cupping tours in Veracruz. While I do not directly report these activities, they gave me a broader sense of context. I also consulted extensive background documentation including official government reports, academic sources, publicly produced data sets, newspaper articles, and industry literature.

Table 8-1 Number of Interviews Conducted

Country	Background Interviews	Interviews with Hub/Export Offices	Case	Interviews with Mills in Cluster
Costa Rica	National 10 (4), Prime Cases 6 (3), Non-Prime Cases 5 (3)	2 (2)	Prime High Coop	28 (23)
			Prime Low Coop	16 (12)
			Non-Prime High Coop	17 (11)
			Non-Prime Low Coop	12 (9)
Mexico	National 3 (-), Veracruz 11 (4), Chiapas 16 (4)	7 (4)	Veracruz High Coop	17(7)
			Veracruz Low Coop	14 (8)
			Chiapas Mestizo	16(5)
			Chiapas Indigenous	14(9)
*Brackets () denote interviews that I recorded and transcribed in part or in full.				

8.3 CR Background Interviews

In Costa Rica, I spoke with three marketing and compliance officials with ICAFE and another representative of CICAFE, and recorded and transcribed two interviews, as well as taking notes for the others. I also spoke with representatives from Costa Rica's specialty coffee association (SCACR), Women in Coffee, the Ministry of Agriculture, FONAFIFO (environmental payments body), two coffee researchers at National University of Costa Rica, and two specialty exporters. Of these, I either recorded and transcribed notes, or took notes of the interview, which I then analyzed. I interviewed and transcribed the recordings of interviews with representatives of two of the largest exporters in their central offices, and a representative of the third at a milling facility.

In all four of the Costa Rica clusters, I interviewed, directly, or indirectly representatives of all the largest mills. Those mill representatives I was not able to reach tended to be much more peripheral actors, *often* small mills, with little or no staff. Out of my interviews, small mills are overrepresented, and in most clusters a combination of multinationals, large private mills, and large cooperatives (where they exist), purchase well over 90% of the coffee.

8.3.1 CR Prime Interviews

In Costa Rica Prime-Low Cooperative, I interviewed representatives of 16 mills: 2 multinationals, 4 medium sized private mills, 3 producers' associations, and 5 micro-mills. I recorded 12 of the interviews, and documented answers with notes from the other 4. Additionally, I spoke to the representative of ICAFE for the region, and interviewed a surveying engineer who worked with the industry.

In Costa Rica Prime High Cooperative, I interviewed representatives of 28 different organizations, including 3 cooperatives, the only multinational physically present in the case, 6 smaller private mills, 4 smaller producers' associations, and 15 small private or micro-mills. Those actors I did not interview were representatives of micro-mills, or mills purchasing coffee in the region without a physical presence. I recorded and transcribed 23 interviews with mills in this region, and consulted the other interviews as notes. For the larger cooperatives, I conducted 4 and 3 interviews respectively. I recorded and transcribed interviews with ICAFE and Ministry of Agriculture representatives in the region, as well as the organizer of a group attempting to create a denomination of origin. I also interviewed representatives from a non-profit organization working on coffee and sustainability.

8.3.2 CR Non-Prime Interviews

In Costa Rica Non-Prime Low Cooperative, I interviewed representatives of 12 mills: one multinational, 2 private mills that purchase large volumes of coffee, 1 smaller private mill that purchases coffee, 3 large estate mills, 1 cooperative with a purchasing agent but no mill in the region, and 4 micromills (of which 1 is a very small producers' association). Of these, I recorded 9 interviews, which were later transcribed, and for the rest of the interviews, I wrote down the responses as notes, or received a written response. I also interviewed with recordings the local ICAFE office and a local agronomist working in coffee, and attended several coffee related events related to CATIE.

In Costa Rica Non-Prime High Cooperative, I interviewed representatives of 17 mills, including both of the full service cooperatives in the area (one very large), the only multinational mill, 2 larger private mills, 4 producers' associations, and 8 micro-mills. Of these, I recorded and transcribed 11, and relied upon notes for the others. I also interviewed local representatives of ICAFE, Ministry of Agriculture, and CNP, and recorded and transcribed 1 interview, taking notes on the other 2.

8.4 Mexico Background Interviews

In the Mexico clusters, it was harder to have a complete picture of all of the supply chain actors, because these are not published publicly (AMECAFE would not share this information due to confidentiality policies). However, I was able to populate my survey roster through interviews with key informants, and government documents. From these lists, I spoke, generally, to the largest purchasers and most established actors. Prior to beginning my field work in Chiapas and Veracruz, I interviewed three different representatives of AMECAFE to better understand the national industry.

8.4.1 Chiapas Interviews

For background information on Chiapas I interviewed, three researchers at ECOSUR university, a researcher at UNAM-San Cristobal, a researcher at the National Anthropology Research Center, two representatives of ProNatura-Sur (an environmental organization which works with coffee and development, as well as the Rainforest Alliance Certification in Mexico), representatives of SAGARPA at the state level, COOP Café administrators, a representative of INCAFECH (Chiapas Coffee Institute) at the state level, the state denomination of origin body, a representative of the Coffee Product System at the state level, as well as the organizations RootCapital, and Impacto Café, which are NGOs that give business support or lend to the cooperative sector.

Three vertically integrated multinational firms purchase the great majority of the coffee in Chiapas. They operate through central offices, and have field staff in different clusters, with varying degrees of presence, ranging from commercial warehouses, to fully staffed regional offices with technical support capabilities. In the case of the multinational exporters, I was able to conduct interviews for representatives of 2 at both the local and hub offices, but for one multinational, I was only able to conduct interviews with the hub office. However, the local offices were used mainly as commercial warehouses and not active in knowledge and collaboration networks.

Additionally, in the Chiapas cases, when a local cooperative was part of a second-level organization, I also conducted interviews at the offices of the second level organization.

In Chiapas Indigenous, I interviewed 12 organizations (one, with multiple interviews) including almost every significant coffee industry organization. These included, 2 larger cooperatives, 1 multinational's local branch, 4 medium sized cooperatives, and 7 very small cooperatives. When cooperatives were linked with second-level groups outside of the region, I also interviewed these, although I do not include them in the 14, as was the case for three of the smaller cooperatives. I was not able to speak to one or two cooperatives, because they do not cooperate with the government, and I did not become aware of their existence until they were reported in the network survey. I recorded and transcribed 9 of the in-region interviews as well as the interviews with the second-level organizations, and recorded the other interviews answers in notes.

For this case I also interviewed the proprietor of an upscale coffee house which was developing micro-lot coffee with select farmers in the region, the administrator of the Museo del Café (Coffee Museum), and the local SAGARPA office. Additionally, several of my interviews with researchers (mentioned above) and NGOs in coffee focused on this region to a greater or lesser extent.

In Chiapas Mestizo I interviewed representatives of 16 organizations. I recorded and transcribed five of the interviews and recorded the others as notes. My recorded interviews were with several of the most important locally embedded actors, including two of the largest cooperatives. My interviews covered a near universe of purchasing organizations, including, the local representatives of 2 multinationals (and the third via an interview with the hub offices), two private organizations (one operating as a purchaser for a multinational), 10 cooperatives and producers' organizations (with a special emphasis on the larger ones), and 2 estate farms with large mills. These are a near universe of organizations in the area, except for several estate farms that I could not make contact with. Additionally, I discussed this case in detail with multinational hub offices, and second-level cooperative organizations with commercial links to the case.

I also interviewed the representative of a certifying organization active in this area, representatives from the federal Protected Areas office active here due to a biosphere reserve that intersects with coffee, a representative of an NGO promoting the biosphere reserve's management, the local SAGARPA office, and the administrator of a café operated by one of the cooperatives in the state capital.

8.4.2 Veracruz Interviews

For background in Veracruz, I interviewed representatives of the Regulatory Council of Veracruz Coffee, AVERCAFE, Veracruz de Altura, the Veracruz Coffee Council, CAFECOL, researchers from INECOL and Chapingo University Huatusco, and SAGARPA in Xalapa.

In Veracruz Low Cooperative I had the largest challenges obtaining interviews, but I managed to interview representatives of 14 organizations (one hub also included interview questions regarding the other Veracruz case). One organization which operates a private chain of coffee shops was not available for the study, but another similar one was. I was not able to secure an interview with one important private milling organization, or the central offices of another national one, although I did speak with its local mill. In this case, I spoke with the largest multinationals purchasing coffee in the area, several diverse private mills (either estates or organizations purchasing coffee), and several small family-operated mills, and one producers association. In this case, I also spoke with several actors related to tourism related activities with coffee, a longstanding exporter, and representatives of emerging regional specialty roasters. I recorded and transcribed 4 of the background interviews, and 9 of the interviews with local milling organizations. The others I recorded as notes. In the case of the multinational hubs which I interviewed, I used their answers for both case studies, and ask case specific questions.

In Veracruz High Cooperative, I interviewed representatives of 17 organizations, and recorded and transcribed 7 interviews. The rest were recorded through interview notes. In the case of the two multinationals with a physical presence in the area, I spoke to representatives of their hubs extensively about the case, and to their agents in the region (with one multinational at the local level, I conducted a brief interview, and was unable to finish the survey). These interviews included 2 cooperatives in the case's main city, and the 4 largest of the 5 producers' organizations organized under a second level cooperative structure (I also interviewed and surveyed the second-level organization), 10 private mills (1 a large estate, 3 organizations that purchased and processed coffee for multinationals, 3 part of larger national networks, 2 medium sized local mills, and a small private mill). These included the large majority of the local actors, although I was unable to contact several estate mills, and one or two private national organizations. Additionally, I interviewed, a local representative of AVERCAFE, and researchers linked to University of Chapingo-Huatusco, which I recorded with notes.

8.5 Analysis of Qualitative Data

I entered secondary data sources (such as articles, reports, and academic works), and transcribed interviews into an NVivo database. I then organized the data by region and case into specific nodes. Due to challenges in interview context, I decided not to create a quantitative coding scheme, because many of my interviews were recorded with hand-written notes. I also referred to notes from some of the transcribed interviews, for clarification and to see my instant interpretations. Additionally, since this dissertation involved months of field work, I became relatively familiar with each case, and took field notes from my observations during the data collection process.

My priority with this chapter was to understand, "how do components of the Adaptive Efficiency Model relate to adaptation?" I reviewed the data by each theme in the adaptive efficiency model, and related those with classes of GVC adaptations either through upgrading, farmer support, or governance reorientation (see Figure X, above). I did this within the context of looking for data related to how the questions regarding the model, as configured in the hypothesis of this dissertation. Thus, the process involved looking for larger themes of adaptation at the case level (see Table X), relating these to my hypotheses and questions regarding adaptive efficiency model in the interview and secondary data.

I then make case by case comparisons with regards to Institutional hypotheses H1 ("Clusters with strong cooperatives will be relatively more resilient") and H2 ("Cluster resilience will correspond to areas whose institutions encourage value chain upgrading"), Relational hypotheses H5 ("Cluster resilience will correspond to stronger social networks and social capital within the cluster (akin to bonding capital)") and H6 ("More resilient clusters will have more open knowledge and collaboration networks (akin to bridging capital)."), and Spatial hypotheses H7 ("Resilient areas will have better access to labor pools and transportation networks."), and H8 ("Resilient areas will benefit from the industrialization economies provided by greater concentration of industry infrastructure and intermediary organizations.").

Of these elements, the weight of the discussion falls on Institutional and Relational elements, but I mention the spatial hypothesis because of data form interviews, and the experience of traveling and observing each case gave a strong impression of the number of auxiliary services available, and the spatial accessibility of producers and mills to markets. In the case of Chiapas, I also discuss Hypothesis 4, which compares the institutional barriers faced by an indigenous cluster to a mestizo cluster.

8.6 Case Discussions

8.6.1 Costa Rica Prime Cases

The area that comprises the Costa Rica (CR) Prime, both the Low Coop and High Coop regions, is historically linked. They are in the same ICAFE administrative region, and as ICAFE has developed its Geographical Denomination program, it has included them together in terms of quality characteristics. The two regions, however, are sufficiently distinct in terms of institutional history that the right to use this Denomination of Origin has been highly contested, to the extent that it has caused internal rifts in the national industry and litigation. These institutional differences have played a key role in the distinct trajectories that these two regions have followed.

8.6.1.1 Costa Rica Prime Low Cooperative

This case is in the mountains directly west of the Central Valley and San Jose. Until the 1990s this area was home to mills owned by a core of Costa Rica's coffee elite, but also had a significant cooperative. Most of these firms failed in the 1990s, and were replaced by multinationals, or a series of smaller private mills, and estates. Many of the larger firms linked to wealthy San Jose families. Lower elevation areas nearer to the city have been subject to urbanization pressures, but the conversion of these areas happened mostly before the beginning of the study period, and the growing areas I focused on tended to be at least 45 minutes outside of San Jose, and at elevations over 1000mls. These areas grow mostly SHB, or the highest commodity grade of coffee, but there are some parts which grow at slightly lower elevations. There are still large multinational mills in the region, but small farmer attrition, and absentee ownership of larger land ownings, have reduced production, although coffees from this region are competitive in cupping competitions. The largest cooperative closed in the early 2000s after mismanaging market risk during a period of low prices.

8.6.1.1.1 Institutional

Costa Rica Prime Low Coop has been settled and farmed longer than Costa Rica Prime High Coop, and is located nearer to San Jose. Because of this, Costa Rica Prime Low Coop was home to large elite owned volume-centered operations that dominated the national industry until the 1990s. They were heavily leveraged during that decade, and then impacted by plummeting commodity prices which went from $280.00 in the late 1990s to below $70.00 by 2003 (Delgado Montoya 2002), and would not return to $280.00 until

2011. Some mills based in this region, such as La Meseta, had a more national focus in terms of product diversification, opening cybercafés for example (Cordero Perez 2000), but were ultimately taken under by the coffee crisis, and had less capacity to innovate in the international specialty market (Barquero 2004). In 2000, La Meseta, had 8 mills in several regions of the country, including within the CR Prime Low Coop area and several in the Central Valley, as well as auxiliary mills. They received coffee from over 9000 producers in 2002-2003, and were the leading national company. However, they closed due to financing and debt problems from low international prices, and their mills were either shuttered or purchased by multinational conglomerates. The two largest mills in Costa Rica Prime Low Coop are now operated by multinationals.

The core mills in this region were always private, and cooperatives never had the significant strength, although one large cooperative operated until 2001 (Coope Jorco), when it closed due to debts and low international prices. Coope Jorco was an important anchor for local producers, and many current mills admitted that the loss of the cooperative had left the region disorganized. The instability of the largest organizations in the region during the coffee crisis was discouraging and disruptive to local farmers, especially small holders. There were not large organizations dedicated to supporting them. Thus, in this region, upgrading was held back by the lack of local value chain intermediaries. The loss of the cooperative also meant that there were fewer programs tailored to helping small holder farmers. One interviewee stated:

> Of all the mills, that was the biggest lost for the area. From them, some of the producers' groups formed, but they are small. After that, the multinationals became stronger. Also, production here has dropped, as it has nationally, but in part is because we lost the cooperative. They offered multiple services to the community, warehouses, finance, a lot. Really their

> bankruptcy hurt the workings of coffee in these parts. Now the multinationals don’t touch the social aspect of coffee. It’s a colder relationship.

A common theme here was that losing the large national and cooperative mills meant losing identity, and a range of services beyond coffee. Local elites became more detached from the industry in this area, and often operated larger farms from afar, in San Jose, reducing investments. Multinational mills have filled the gap to some extent. One of the two multinationals in this region attempted, unsuccessfully, to vertically integrate a large farm in the late 2000s, and since then has focused more on buying coffee from smaller mills for export, and its own roasting business. The other uses its base in this area to buy from both Costa Rica Low Cooperative and Costa Rica High Cooperative, and operates the Nespresso AAA program. This is a buyer driven program, where environmental standards (based on Rainforest Alliance standards), farm management, and progressive quality improvements are supported through price premiums, credit, and a farm management program supported by field agronomists (Nestle 2011).

Two of the largest multinationals in Costa Rica have opened up what they describe as sustainability divisions. These are teams that offer access to certifications, (such as Starbucks Café Practices, Nestle 4C, Café Practices, Nespresso AAA, and Rainforest Alliance) which pay slightly higher prices, and bring agronomical support, credit services, and access to reduced price products. Of these, Nespresso AAA is the most important, because it combines RA certification, with purchasing programs, special incentives, and farm-level management plans. It is, however, selectively managed in regions identified by Nestle.

The two large multinationals focus on areas of high potential, where cooperatives are weaker (Diaz-Porras and Hartley Ballestero 2014), and from my interview with one, they seem to favor larger farms, although in my interview with them, they emphasized that they also have many small holder farmers. However, participation in this AAA sustainability program is pre-verified and selected in terms of the quality of the coffee produced by the farm, and the capacity of the farmer to go through upgrading programs.

Another smaller multinational also purchases important volumes from this area, but it is located outside the cluster in the Central Valley. The purchasing practices of these mills, and others from the Central Valley, is contested by some. Many suspect, without any clear proof in my interviews, that they mix coffees from other areas, and use the region's name to the detriment of the regional identity of Tarrazu. One of the larger cooperatives from the High Cooperative pairing also purchases coffee grown in this region, but it is not a large amount of their total volume, and their presence is not as a primary actor.

In addition, estate coffee farms, which buy coffee from neighboring farms and others with whom they have relationships. Unlike other mills, they do not operate large raw bean purchasing operations, based around collection points in neighborhoods. Doing so would require a focus on credit and volume, while these mills have historically focused on specialty markets. Several have European and American owners, who connected the estate farms with important buyers in Europe or to the US market for specialty coffees. These farms were early innovators in selling specialty grade coffees to international purchasers, such as Green Mountain Coffee Roasters and Starbucks. They now operate with certifications, such as Rainforest Alliance, and occupy a niche of large lot specialty, albeit to a much larger range of clients.

In the vacuum created by the absence of large traditional cooperatives, several producers' associations (types of cooperatives) emerged, in part to provide new value-added strategies to farmers. One group formed as neighbors and family in an area decided to dedicate themselves to organic coffee production in the 2000s, as a way of reducing costs, avoiding pesticide exposures, and finding new markets as organics and Fair Trade emerged. This is a small group, but they are the management center for a larger network of small Fair Trade and Organic groups.

The other group is larger, and formed after a hurricane in the 1990s as an agricultural self-help society, with the mission to help farm families recover, and also to build better housing. When the area's larger cooperative closed, the self-help group obtained funding to open a micromill through MAG and external funding sources. The overall organization has 1,000 members, and engages in many community oriented activities, especially housing. Less than 200 members produce coffee, but the cooperative is able to provide them with agroforestry support, technical assistance from agronomists, coordinated plant care packages with supply centers in the area, and have excelled at producing micro-lots. Recognizing that the loss of the previous high volume-oriented cooperative was a challenge to farmers, the new group has excelled in improving quality, and preparing micro-lots for the ultra-specialty market, which has led to significant price premiums.

Small cooperative producers' groups in the region, are active in innovation, and value added strategies, as an alternative to the loss of large cooperatively controlled volumes and low prices. They also recognize that producers need comprehensive social and agricultural support to sustain investments and the commitment to quality necessary to make small holder coffee farming profitable in Costa Rica over the long run. However, they only could engage in these strategies in groups much smaller than traditional cooperatives, and they are unable to benefit from the organizational benefits enjoyed by larger mills.

Without a clear upgrading strategy, the margins for smaller cooperatives, or producers' associations, are too low, and the commodities markets are too unstable for small holders. These chronic price problems related to commodities markets was a common theme in interviews with smaller farmers' associations, as was access to capital for investments. One of these groups focus on techniques for transitioning to organic coffee farming, exporting as Fair Trade coffee, and strengthening long-term relationships with buyers who want to purchase both Fair Trade and specialty coffee with Costa Rican premiums. They also exported for other groups who did not have the Fair Trade certification, and built a dry mill to create export capabilities to support export. Both of these groups received support to start from MAG in a program aimed at fostering lower input farming, and one started to work with organic coffee to fill a niche requested by an exporter. To some extent compete for the small quantities of certified organic coffee produced in the region.

Microlots (i.e., small segments of the farm dedicated to specialty coffee, differentiated by variety, altitude, etc.) is another adaptation promoted by producers' associations in the region. Microlot farmers tend to be former cooperative associates who did not want to sell to multinationals, or felt they could develop superior coffees. One producers' association and private mill, organized around a large farm with outside capital support, has focused on processing microlots for other farmers. This private mill is a member of the Specialty Coffee Association (SCACR) and is professionally managed, with support from outside capital. They revived an abandoned farm, and began producing award winning coffee. Their manager came from the nearby producer's association, where he had created a strong model for specialty production, and they now compliment their internal production with specialized processing services (it is not clear how payments work under ICAFE's regulations).

Microlot farming fills a niche that larger mills are unable to fill and provides an outlet for small farmers who produce high quality products. Large mills in the region related that this market niche was not viable for them because they run volume operations from thousands of famers, and microlots require total traceability to the farm. Adding such programs would require new investments in technology, and they are hamstrung by ICAFE's regulations, which require mills to pay farmers equally based on a limited number of categories. Mills cannot pay more for larger volumes of coffee, and the ability to create prices on a micro-level is administratively challenging.

Instead, exporters buy processed coffee from smaller mills, but they are not generally involved in developing or fostering them. Exporters (or larger mills?) are concerned that increasing medium sized producers with high quality coffee create mills will create greater competition for this coffee and dilute the quality receive in general. Larger mills often market coffees as blends, and have technology for very precise sorting and grading.

Administrators at multinational hubs indicated they would like to offer greater incentives, but they feel that ICAFE's regulations favor cooperatives, which operate tax free, and take away the possibility of making better financial offers to the strongest producers. ICAFE explicitly attempts to decouple the price of coffee from the amount sold, only allowing bonuses for quality. Larger private mills think this limits their ability to court the best producers with better prices, and in some ways has incentivized micromills over quality and loyalty programs.

Producers' associations in the region (which are forms of small, tightly controlled cooperatives, many of which started after larger mills closed) offer farmer support like larger cooperatives, including credit for farming and housing, technical assistance, a nursery, milling and roasting. They recreate the cooperative structure for a specialty niche, collectively pursue value added strategies, and create mechanisms for learning and mutual support. The degree of capacity for these activities varies greatly among the producers' associations, with some integrated into export, others not, and some offering auxiliary services. This in part depends on the size. For example, the non-organic producers' association in this area is much larger than the others, with nearly a thousand member/farmers, and can thus develop more sophisticated programs. Despite being the largest producers' association in the region, this organization was still managing much lower volumes by orders of magnitude than the cooperatives in the High Cooperative pairing. Smaller sizes for these reconfigured post-traditional cooperative groupings, may allow them to successfully enter the practice of microlots, and consistently place their members in the Cup of Excellence.

This speaks to the capacity of coffee in this region, and begs the question of why, if the coffee is of good enough quality, the market has not fully developed. Many large farms have families anchored in the city, and have not seen benefits for reinvestment, and a lack of local anchor mills, suggests that disorganization and lack of motivation are key drivers of this trend. The current situation has led in part to the development of one organization in the High Cooperative neighboring area explicitly dedicated to lobbying against the inclusion of the CR Prime Low Coop region in the Tarrazu denomination of origin system. Those producers oppose the practice of large multinational mills purchasing coffee in this area, which they argue is mixed with coffee from different areas, as well as an arguing that this sub-cluster has not actively participated in the reputational development of the Tarrazu region. On the other hand, representatives of a mill in the CR Prime Low Coop cluster noted that they received lower prices than the High Cooperative pairing, presumably because cooperatives are competing more effectively on price, and because of the development of better farming practices. These interviewees felt that their farm, and others, who did well in the specialty market were examples of the need for regional development, not any inherent differences in the natural or social environments.

CR Prime Low Coop region is falling behind on another adaptation, and that is the development of "micromills" (i.e., mills operated by small farmers), as the weakness of the area's overall coffee industry has discouraged many from making the investment. To avoid risks, many farmers in this area who have considered opening a micro mill, have decided instead to participate in a buyer-driven program with a multinational, Nestle AAA. This provides credit, specific farm management plans, access to environmental certifications, specifically Rainforest Alliance, reduced price chemical inputs on credit, and program premiums. The long-term benefits and costs of these two strategies are still unclear, and while micromills offer greater potential room for autonomy and reputation building, the buyer-driven programs do not require start-up capital, can reach more farmers, and may insulate from risk.

Lastly, efforts to improve coffee in the area, or lobby for farmers in these municipalities, is currently dependent on the government and firms, and there are no cluster-level institutions, aside from the mills who are competitors among each other, specifically dedicated to organizing the collective improvement of the region. Collective marketing strategies are lacking in the region. The exception is an annual coffee fair, which instead of being initiated by organized actors in the area came from the initiative of a local priest in 2003 to create a parochial activity, but it touched a nerve with the cultural traditions of the area, and has become an important community event that builds consciousness about coffee. The event now has important sponsors in the national industry, but is not a coordinated effort by the regions producers and mills to develop the cluster, rather a grassroots cultural expression.

8.6.1.1.2 Relational

Respondents in CR Prime Low Coop in general considered that there was very little local collaboration. Part of this is that the dominant local mills compete primarily on price, and do not play a collaborative role with other mills. While their employees are members of the community, the administration of the dominant mills occurs in central offices outside the region, which is where their principal contact with the government and the coffee supply chain occurs. These mills also have strong internalized capabilities. They tend to employ their own agronomists, have national buying and finance strategies and access to global networks of information; part of the multinational export hub business model is to operate regional satellite offices. Since they are in many ways the strongest actors in terms of price mechanisms, they may have little incentive to help smaller competitors; and because they can switch regions within a country and globally, they have low long-term commitment to the locality. Controlling links to global knowledge and resources is a key competitive advantage, and they have is no incentive to share these without a clear sense of long-term benefits. Their management also tends to lack the deep community links that locally owned and operated private mills have; they may have relationships with other regional managers, but these are not generally collaborative. That is not to say they are not engaged with the peers in the coffee industry, rather their engagement is at the international level, or in interaction with other large mills via national-level forums such as the Coffee Chamber and the Exporters Guild.

Where locally owned mills interact with these companies is one step up the commodity chain, at the export offices of the larger commodities firms. Nevertheless, these multinational companies have developed and continue to develop some programs to support local farmers. Interviewees suggested that this part this is because of the risk of attrition, and dwindling coffee supplies in this area and others in Costa Rica, and as a competitive strategy considering the structural difficulties faced by farmers as well as greater consumer awareness about sustainability at origin.

These are much the same services offered by cooperatives to member suppliers. However, of the two large mills in CR Prime Low Coop, only one sponsors Nespresso AAA, because this program is licensed exclusively by region. Another has the program in other areas, such as CR Non-Prime Low Coop, and runs its mill for this area out of CR

Prime High-Coop. The third large exporter in Costa Rica who was not granted, or did not compete for a Nespresso cluster has not opened a sustainability division.

All three-purchase coffee in this region. One still competes mainly on price, although it is an intermittent supplier to the Starbucks Café Practices program; it has not opened a division to support farmers to upgrade their product, but is starting a program to market roasted coffee nationally with a special seal, and to pay a higher price to farmers producing fewer than 500 pounds of green coffee. They are doing this in part out of social consciousness related to the income strain low prices put on small holder family, and in part because of the problem their mill has identified that the region has many farms that are practically abandoned (producing less coffee because a lack of investment), and small producers are in tenuous positions.

The multinational which runs Nespresso AAA, does have sustainability division staff in the region, working with farmers, and promoting certifications, such as Rainforest Alliance. As this demonstrates, the large multinational mills have some capacity and interest in reaching out and providing services to farmers, and building relationships at the first step in the value chain, but they are restricted to global strategies and the interest of large institutional buyers to subsidize these programs. My interviewees held environmental and social ideas about coffee like their nationally owned and cooperatively owned peers, but they were distinguished by the fact that their primary competitive strategy was to pay higher prices for coffee that met higher standards.

While less embedded locally, the multinational firms have relational advantages in terms of international institutions. The primary advantages are access to international lenders, and in- house technical capabilities. For example, Nespresso AAA is a sustainably program and support program for farmers, based on the standards and practices of Rainforest Alliance, which has been adjusted for a specific corporation. This project is part of the company's international efforts to set-up a sustainability division, which have been financed by the International Finance Corporation of the World Bank, and is the impetus for the multinational exporters to open sustainability divisions.

Very few of the locally-owned mills reported relationships with the multinational mills at the local levels. While the managers periodically speak to each other, they see one another mostly as competitors. The multi-nationals are the largest mills in this sub-cluster, and thus the fact that they are not directly engaged with the other mills has the ramification that the local buzz in the cluster is not centered around strong, vertically integrated, locally anchored organizations. Several of the smaller mills maintain contacts among one another, especially when their management have common employment histories.

Past work experience together among mill administrators did appear to foster lasting relationships. For example, the manager of the premier private mill dedicated to selling coffee differentiated by parcel and rigorous cherry selection criteria (microlots) worked with the larger producers' association in the cluster before going to the private mill. He still maintains a strong collaborative and friendly relationship with them, and they frequently visit each other. However, relationships at the local level occur among locally embedded actors, and there are too few mills in this sub-cluster to develop the enough of these types of relationships to build a strong network. The loss of major private, locally-owned companies, such as La Meseta, and Coope Jorco at the beginning of the 2000s has been an impediment to strong local networks. Few of the mills have had the resources, for example, to be members of the Specialty Coffee Association, and only the largest actors are part of the Coffee Chamber. Because the national associations often are made up of the highest levels of management, who in many cases work out of San Jose, their impact on relationships within the cluster are minimized, although they are an important source of external information.

In terms of government relationships, and relationships with other actors, this sub-cluster had few examples of firms that worked with international NGOs, or of collaboration with educational institutions or research, despite its proximity to San Jose, the hub of these activities in Costa Rica. Some mills, including those involved in organic coffee, and some of the large mills were skeptical of ICAFE's effectiveness. One noted that there was no institutional support for organics, while another stated that "what ICAFE does well is control the business…but from real support in innovation and reduce costs, not much." However, other mills did have strong relationships with ICAFE, both at the regional and central levels, taking advantage of laboratories, and other amenities. Even though the ICAFE regional offices are located a half-hour away in the High Cooperative zone

8.6.1.1.3 Spatial

This area is closer to the national capital San Jose than any other region, which has a twofold effect. Many of the elite coffee farmers in the area always maintained social and business connections to San Jose, and when the industry suffered, they simply exited and entered other industries. For small holder farmers, the transition was slower, and often involved part-time employment outside agriculture. However, the proximity also provides easy access to many mills and suppliers. Many respondents in this region reported that they did not need regional services because they had access to central government and banking institutions in San Jose, although access and transportation were not a common complaint in Costa Rica High Cooperative, or other regions in Costa Rica. Furthermore, the breakdown of the largest locally owned mills meant that the geographic nodes of the industry were no longer in the center of the coffee growing towns. To some extent this had always been a trend in this area, in comparison to the High Cooperative cases, but it was exacerbated by the loss of the large cooperative, which had for decades been at the center of one of the villages.

In CR Prime Low Coop the main challenge has not been the lack of geographic proximity to access infrastructure, knowledge, or other resources, but lack of sufficient local coherence such that the industry could organize around its own centers, both in terms of knowledge exchange, and building a coherent identity. The lack of strong locally embedded mills at the cluster level, means that the local CR Prime Low Coop industry has lost agricultural identity to the larger Central Valley. Two of the coffee producing areas are part of municipalities which have partially urbanized, so the coffee producing areas are quite different economically than the towns that service them. One interviewee noted "…[this Canton] produces more than [one in CR Prime High Coop], sometimes we trick ourselves, the municipalities are more in line than you think. In [the mountains] there is a lot of coffee…" It is not that the concentration of the core producing areas is directly threatened by urbanization -- many areas are quite remote--, but that the competition with the many activities in the urban areas makes it harder to create a local buzz.

In fact, centrality means that access to the city means both access to central coffee institutions, but also to other job markets. The cluster's location near San Jose makes access to ICAFE, and diverse exporters easier. Some mills noted that ICAFE has used them as an example, and that they benefited from this relationship and the exposure. For example, they are often a first and easy stop on trips organized by specialty export brokers, or for the press. In this sense, location should be an advantage for this case, but the competing employment opportunities are undermining the agricultural society. When coffee is not a central activity of the community, small holder producers have less commitment. This affects the regions' organizations, weakening them and undermining the institutional governance structure. This has a self-reinforcing effect, leading to less investment, which translates into greater weakness against competing activities, and, eventually, exit from coffee and land use transitions at the landscape scale.

8.6.1.2 Costa Rica Prime High Cooperative

8.6.1.2.1 Institutional

Costa Rica Prime High Cooperative has three long-standing cooperatives (a fourth closed in the early 2000s), which purchase most the coffee grown in the area, and, in some parts of the cluster, nearly all the coffee produced. One of the cooperatives is the largest coffee mill in Costa Rica. At the beginning of the study period, one of the three cooperatives purchased over 96% of the coffee from its principle Canton.

Chapter 6 data show that this cluster was relatively more resilient in quantitative terms than its comparison case, but to get to this point the cooperatives had to modernize greatly during the 2000s. They have undertaken changes to professionalize their staff, and worked on exploiting specialty niches. The two largest cooperatives in the area started undertaking this process in the 2000s and are now vertically integrated, while the smallest has been slower to modernize, and until recently was managed by farmer-members, although they have employed a professional agronomist for the last decade. Along with professionalization of management, the larger organizations have adopted more financially sophisticated risk management (Parizat et al 2015).

To give some context in how this works at the organizational level, one of the cooperatives runs its own experimental farm, employs agronomical staff for farm visits, maintains an office focused on environmental certifications, has opened a coffee shop, operates a credit service, provides mill tours, and operates an in-house dry mill is also a lead firm in an export consortium (which is operated as a separate entity owned by the cooperative), and roasts its own coffee for the domestic market. This requires significant staffing, which is only possible because of large volumes, innovation, and price premiums based on quality, and certification programs. This contrasts to smaller producer's associations, which may have only one or two dedicated staff, and to multinational mills who only operate purchasing and milling in the cluster, while the management and knowledge related positions are staffed centrally.

All three of these cooperatives are significant organizations for the community. They sponsor community events, promote health, and one even runs cooperative supermarkets and gas stations. All the three cooperatives run hardware and supply stores (the largest has three), where members can purchase on credit. They provide fertilizer and other inputs to farmers. It is this wide range of services that makes cooperatives crucial for the local communities. Many interviewees said that the cooperatives offered better prices to farmers in bad times, making the private and multinational mills follow suit; furthermore, they provided credit to cover weak markets. One respondent commented, “When prices are good [the multinationals] offer one everything, but when things are bad, they cut off the help. One needs help in good times and bad, which is why many people are loyal to the cooperatives.”

The pride in these organizations is frequently accompanied by suspicion of multinationals from those allied with the cooperative movement. However, this is not universal; one smaller mill operator noted that after a cooperative closed in his town in the early 2000s, the government could do very little, and the other cooperatives were not fully capable of absorbing hundreds of new members. In this situation, the arrival of multinational buyers was important. To further complicate the picture, the largest of the three remaining cooperatives rents and operates a large mill for a multinational exporter, who has the Nespresso AAA franchise for this area. The cooperative and the multinational have a strong relationship, and competitively, the multinational has focused on the largest farms, bought coffee from the coverage area of the smallest of the three cooperatives in this case. However, an employee of both the cooperative and the multinational noted that, while the multinational was a decent business, locally their effects could not be compared because of the social role the cooperative plays, and the range of services it offers, while the multinational competes mainly on price.

Some of the suspicion towards multinationals comes from the use of the name Tarrazu. At one point, coffee was being sold under the Tarrazu label that was not even from any part of the region. In the 2000s, a local group of growers, the Los Santos Association for Denomination of Origin, started a campaign to create a legally enforceable geographical mark (in the sense of a trademark) for the CR Prime High Coop area, and to set up a governance committee to certify local coffee of high quality to use this mark. The initiative has broad support, including from the cooperatives, although it is not a core priority for them. It came to a head when ICAFE started its own Denomination of Origin system, and created a much larger Tarrazu region, including CR Prime Low Coop. Local actors felt that their initiative had been hijacked. While this conflict is ongoing and unresolved, it represents the tensions of scale for governance in coffee, and issues in agenda setting, it also represents institution building as an adaptive mechanism in this region.

Besides the predominant role of local cooperatives, and initiatives to build an institutional structure to support the cluster's identity in international markets, CR Prime High Coop is distinct as an epicenter of what has been described as the "micromill revolution" (Mena 2014). These are estates and small farms that mill and export highly selected batches of coffee to the very high echelons of the specialty market. Farms and farmer names are often featured in product packaging, and can receive much higher prices through direct trade (Transparent-Trade 2016). After seeing the success of a few pioneers in this region, the owners of larger farms in some select areas started small on-farm mills, focusing on smaller amounts of coffee, aimed at non-commodity-anchored markets. Most are owned by individual families, although several are run by producers' associations, mostly organized around neighborhood level family structures.[i]

Micromills and Specialty Brokers:

The third wave of coffee created interest in “directly traded” coffee of the highest quality marketed around the personality of farmers and the *terroir* of estates. This was facilitated by the Cup of Excellence Competition to identify excellent growers and new small milling units, but it also needed new GVC intermediaries.

What is important for these mills is attracting international buyers, who assume that coffee with a good flavor profile is environmentally friendly, and to do that they faced a steep learning curve, one that is virtually impossible without an expert broker. These knowledge and relational transaction costs, not to mention language barriers, mean that without intermediaries, few farmers could establish relationships with foreign roasters. In the 2000s, early pioneers in independent mills selling directly to international buyers had success, and caught the eye of other growers. But the expansion of this model to smaller mills required a new intermediary type. At first, these specialty intermediaries were working with very few mills, some attached to larger farms and well known producers, but these exporters soon transformed into important knowledge gatekeepers.

Some of the crucial brokers began with larger coffee exporters, and formed relationships with large national millers, such as the now defunct La Meseta, (Castillo Nieto 2007). Starting in the 1990s export brokers started to develop this market with smaller farmers and mills. One of the first of these companies was founded the same year as the Costa Rica Specialty Coffee Association in 1994 (Castillo Nieto 2007), and refers to itself as a casamentera (“matchmaker”), bringing roasters to farmers. These matchmakers are important not just for individual farms, but also for the development of micro mills in regions, especially in the specialty coffee period which is now not organized exclusively around large estates, but also includes many small farmers, who entered the networks by providing a samples and consulting about cup possibilities.

In Costa Rica, the premier specialty broker is somewhat of a king maker in this small market niche, and now represents at least 90 mills, which is almost as many mills as were in Costa Rica in the late 1990s when the country hit its peak production volume before the coffee crisis. The majority of his mills are in the CR Prime High Coop region, because of interest and the sought out after cup profile.

ICAFE had very little to do with the initial process of micromill development. A local ICAFE representative described the emergence of micromills as spontaneous. However, they are in large part the result of blind cupping competitions, such as COE’s Cup of Excellence, which crowns champion lots each year to be sold in global internet auctions to high end “third wave” coffee brands around the world. Moreover, the local Ministry of Agriculture (MAG) representative was especially entrepreneurial about pushing micromills. In the early 2000s new milling equipment appeared on the market allowed much smaller farms to process their own coffee without sacrificing quality, and with less water. This was seen as an opportunity for farmers to create differentiated coffee and to avoid losing their personalities in the value chain. MAG also sponsored the creation of a local Los Santos Micromill Association, with the idea that it might help reduce transaction costs and help smaller mills negotiate together. This included financing the construction of a warehouse, and preparation facility that all farmers in the area could access for a minimal fee. The Micromill Association holds monthly meetings, and has acted as a coordinator with ICAFE and CICAFE to work on small scale milling. In addition, several farmers noted bureaucratic problems with coffees grown at higher elevations that was traditional in Costa Rica (over 2000 meters) for cup profile, because they ripen after the official harvest, and require special permissions.

These specialty exporters, along with micromills, represented an important act of institutional adaptation to promote coffee resilience. However, the small volumes they represent mean that exclusive coffee exporters are not a solution for national, or even regional coffee industries that are dominated by small landholder farmers. One coffee blog even asked if micro-lots were not the coffee equivalent of the 1%s. However, they have pushed the bar on differentiated coffees, which has led to innovations with cooperatives and multinational commodities firms. They may be important for creating reputation in hyper-differentiated global markets, and respondents almost universally noted that the region’s reputation was key for the future of the cluster’s coffee.

While ICAFE did not push many of the changes in the coffee industry, many respondents noted how its clinics and outreach were crucial to supporting farmers in terms of farming methods and also of milling. CICAFE, the research arm of ICAFE, runs a milling research program, and also offers regional classes. One complaint from some more senior producers was that ICAFE used to have demonstration parcels and experiments at the regional level, but that since the opening of CICAFE, research has been, for the most part, consolidated to a centralized location. The effect is that research projects are less focused on the immediate needs of the

Coffee Rust:

The mechanisms used by ICAFE were clearly observed in this region during the coffee rust outbreak. Nationally, they helped coordinate government support and new credit lines for farmers; they have also been working for over a decade on coffee rust resistant varietals, and experimenting with those from other countries, and were ready to start distributing them to farmers to replant in the most susceptible areas. At the regional level, ICAFE and MAG collaborated on outreach, sponsoring over 20 meetings in 2012-2013 to talk about coffee rust with farmers (ICAFE 2015). While CR Prime High Coop region was relatively less susceptible to coffee rust because of its climate, the outbreak was a major issue because it was new to farmers, and particularly threatened vulnerable farms that had underinvested in plant nutrition and had older plants. ICAFE quickly started conducting farm inspections to monitor the presence of coffee rust, and coordinated with fungicide producers to create a response plan. Eventually, the national offices developed a national model for farm management to prevent and address coffee rust, as well as a program to give farmers approved fungicides to spray twice yearly. The regional offices have implemented this plan in both CR Prime High Coop and Low Coop with relative success; however, ICAFE noted that in the former case outreach was easier because of the range of farmer organizations, such as the cooperatives and the micro mills associations.

region. Then there are those who are suspicious of its efficacy. However, even those who are suspicious framed their problems with the organization as its being ineffective, as opposed to harmful. What is most frequently criticized is that ICAFE has few staff, and one must be proactive to obtain direct support.

In this case, this is ameliorated by the fact that the largest two cooperatives have their own demonstration farms, agronomical staff, and outreach programs, and use ICAFE or CICAFE for long-term projects, but are less reliant on its day to day technical involvement. Those who do rely upon ICAFE are smaller mills and cooperative producers' associations,that help ICAFE set up workshops and do outreach with farmers.

8.6.1.2.2 Relational

The richer institutional environment in Costa Rica Prime High Cooperative fosters a richer relational environment. It hosts more institutions, from the Micromill Association, to the Denomination of Origin group, to the cooperatives that actively sponsor forums for social and knowledge sharing.

Cooperatives, even as the biggest ones become more professionally managed, are still in the end governed by assemblies of coffee farmers, and create a range of committees and working groups that directly involve the farmers. These are forums for learning, and for dissemination for farmers that build social capital (Snider et al 2017), and the cooperative representatives I interviewed noted that they are core to long-term upgrading and maintaining investments in farms. part of larger strategies.

Successful cooperatives have skillfully used international sustainability networks through certifications as a competitive strategy (Diaz-Porras and Hartley Ballestero 2014). More than price, the cooperatives explained to me that they are marketing tools, which facilitate accessing knowledge and international environmental networks. Linking into these networks improves their reputation, and I observed that it also brings interest from research institutions, and NGOs. Researchers from national and local universities, as well as international research groups (e.g. France's CIRAD, Costa Rica's CATIE), are constantly in contact with the cooperatives, which in turn work on collaborative projects, host international visitors, and are key intermediaries between knowledge networks and the local industry. These relationships are a mix of interest in the region, and the fact that these are strong cooperatives with what Giuliani (2007) describes as “absorptive capacity,” and also strong social capital (Snider et al 2017).

An example of how this leads to adaptation in tis cluster is that one cooperative was recently certified as carbon neutral, a first in the industry, and is part of the national government’s pilot program to create a model which could make this guarantee for the entire national industry under Costa Rica’s Nationally Appropriate Mitigation Action (NAMA) for coffee, which is part of global climate agreements. Costa Rica, and this mill, hope that they can use this process not only as an exercise in industrial ecology to improve the use of fertilizers and help better prepare farms for rising temperatures through the use of more shade, but also to stick out in the crowded market of global coffee as a unique socially conscious product. This is possible because the cooperatives of the region are open to external networks, and powerful within coffee governing structures.

Much of this has to do with certifications. The participation of the cooperatives in these networks started in the mid-2000s, and may have emerged as a mixture of adaptive strategy in the face of the coffee crisis, and response to Costa Rica’s environmental regulation. Other studies have made parallel observations of the importance of these certifications (Samper 2010, Snider et al 2016). Two of the cooperatives in this region are Fair Trade certified and have been since the mid 2000s. For the largest two this is less important, and the strongest cooperatives have used Rainforest Alliance as an upgrading platform for their operations as mills, and for the cultivation of their best farmers. The large multinational mills can run these programs, and in the case of Nespresso AAA, the mill with the franchise is in Costa Rica Prime Low Cooperative. They have used the program to expand their purchasing program, especially in the area where the smallest cooperative in the Prime High Coop area is located. To some extent these programs may bring similar benefits to producers regardless of whether they are administered by multinationals or cooperatives.

In this case, both multinationals and cooperatives used valuable knowledge and relationships with exterior actors as club goods with some degree of exclusion (some micromills felt that the cooperatives opposed their existence). They do not actively share information with competitors, but the larger mills often help each other, and develop relationships through common associations, and certifications. In this sense, the largest cooperatives also have affinities and relationships with the multinational exporters, even though some within the organizations on both sides harbor the attitudes that they are not honest competitors.

The cooperatives, though, are much more embedded actors. Many locals learn about the industry through employment with these organizations, either as mill workers or in management positions for the more elite families. For example, one of the leading specialty “micro-mill” producers in CR Prime High Coop was once a cooperative director, and developed contacts with international buyers. He worked with his son, who was studying business, and developed a business plan for a mill on their farm. They then used this as a platform to develop a very successful business, place consistently in the Cup of Excellence, became innovators in microlot sales, and then opened a series of coffee shops. He is no longer associated with the cooperatives, although he interacts with their management socially and at industry events, but is now more immersed in the network of specialty exporters, and with international clients.

The ubiquity of these links to the cooperatives spills over because almost everyone has a link to common organizations, either through current involvement, past membership, or family ties. This makes other organization easier, such as the creation of the Micromill Association. In my interviews, cooperative representatives saw the micromills helping the reputation of the region, but also recognized that they did potentially threaten cohesiveness. Some argued that micromills can undermine the idea of community in coffee, and in the end leave producers more vulnerable.

Micromills are more dependent on local networks than other institutional types of coffee firms. Even farmers who criticized the Micromill Association as spinning its wheels, noted that it had been an important meeting place for them to learn about key actors in the "movement," the best practices, in demand coffee varietals, and government policy. In this sense, they are reproducing the associative culture of communities where cooperatives are dominant, but they have trouble harnessing collective action as a series of diffuse organizations. Because most micromill operators started as a means of differentiating themselves from larger mills, purposeful market coordination, which was the original vision of the Micromills Association, has been slow. For example, the MAG sponsored warehouse has been slow to take off, and few have been willing to risk current market arrangements in order to create a local export platform.

The Specialty Coffee Association, for example, faced barriers in developing membership among micromills, because of membership fees and distance, and was dominated by export brokers, and multinationals. This was less a problem in Costa Rica High Cooperative, because the brokers often sponsored activities with micromills in the region. Thus, CR Prime High Coop has benefited from this process, although in some ways it has transferred power to extra-local actors.

In general, the key actors in CR Prime High Coop are well integrated into the country's core institutions. The largest mills are active in the Coffee Chamber and ICAFE, and have established relationships with other governance agencies. Smaller mills tend to have more transactional relationships with these entities, although in general they reported reasonably high levels of trust.

8.6.1.2.3 Spatial

Costa Rica Prime High Coop is organized around three towns, and a fourth village. The two largest cooperatives are located in the two largest towns, where they occupy a central place to the culture both symbolically and spatially. The third is located in a river valley, on the main route from the village to the third township. The largest cooperative operates over 40 receiving stations (Valenciano Salazar 2008) and extends its reach into CR Prime Low Coop. However, each cooperative is primarily concentrated on its core area of service for most of its volume. They can do this because the area has a high concentration of coffee farms, and farmers. Thus, the spatial concentration of farmers and mills are self-reinforcing, benefiting from industry agglomeration. This makes each receiving point more profitable, which creates a larger margin of safety for the presence of diverse actors to weather market downturns. The farmers in one town are clustered close enough around a town center that the cooperative for that town receives most of its coffee at a central location and doesn't need a large system of receiving stations. While much of the coffee agriculture in CR Prime High Coop is geographically isolated, there is a well-maintained central road network, and a range of service providers in towns, ranging from banks in the township centers to hardware stores. This mix of agricultural concentration and relative isolation from the Central Valley creates benefits from agglomeration that would not be possible if there were significantly less coffee.

All of this fosters competition for coffee, which drives up price in Costa Rica High Coop, and is partly responsible for differentials being more than $30 above the global commodity price per pound for their quality grade.

8.6.2 Costa Rica Non-Prime Cases

8.6.2.1 CR Non-Prime Low Coop

8.6.2.1.1 Institutional

The main town in the CR Non-Prime Low Coop region is Turrialba, which currently has 10 mills, several of which are micro mills. Turrialba was once a bastion of the national industry, and in general is a productive agricultural region, with a famous mountain cheese and sugar cane production at lower elevations. Despite this, many producers face greater challenges than farmers in the Prime regions because of harvesting schedules that do not promote synchronous flowering and maturation. This happens because rainfall extends through the year instead of occurring in just one distinct season, as in the Prime regions. What results is inefficient harvesting, as cherries are maturing at different times. However, within CR Non-Prime Low Coop there are a series of microclimates where highly sought-after coffees grow.

Today there are four private independently owned, medium-small to large mills, all of which have their own estates, and two of which buy coffee from other producers. Of the large estates, the two largest are well known in Costa Rica for their high yields, and were pioneers in certification, and use these to improve processes and quality and to gain the attention of buyers who may have overlooked coffee from their region otherwise. Two of the three largest estates in this area are certified by organizations, Rainforest Alliance, Utz, and Cafe Practices, but they do not sponsor group certifications.

There is also a multinational which operates a series of farms in a highly prized sub region, and holds a license for a Nespresso AAA cluster there, primarily working with larger farmers. The future of the multinational mill is unclear. There is a partnership now where the largest of the private independent mills processes both coffee it buys, and that of the multinational, like the arrangement in CR Non-Prime High Coop. This strategy is the precursor to moving the wet milling operations for that cluster's program, on a contractual basis under the license of the multinational mill.

Other mills, including non-regional cooperatives, intermittently operate closed mills, or open receiving points. Beyond these, several large estates operate in the same sub-area as the Nespresso AAA cluster, and another series of farmers have opened smaller mills based on estates. Of the smaller estate mills, there are three in the higher-reputation sub region, which also operate these certifications through the multinational mill. They sell a mix of their coffee through this program, but send parts of their crops to specialty brokers as micro lots.

There is alsoa newly revived group of organic producers, which is still very small (It is the second iteration of a failed attempt sponsored by MAG and a Catholic organization to create a larger producers' group focused on organic coffee).

What stands out about this region is that it has lost a large quantity of its small holder farmers. Thus, the average farm size here is larger than in CR Non-Prime High Coop; this is the result of a few large estates. Outside of the sub-region where the Nespresso cluster operates, mills do not operate with group certifications, nor do they have a formal agronomical support program for farmers. Because there are coffees from various elevations, some of the three large receiving mills each operate with differentiated pricing structures. The mills offer credit and reduced price support, but there much reduced opportunities for small holder farmers to work with certifications or farmer support programs if they are outside areas that have a sought-after cup profile.

The Non-Prime Low Coop sub-cluster once had 3 cooperatives which survived into the 2000s. Although they were not as large as in the Non-Prime High Coop case, or the core regions of the Prime cases, they played an important part in the community. I encountered a sentiment that "after the closing the farmer was hurt, emotionally and financially, and lacked trust to join another cooperative again." One informant who runs a smaller private mill recounted that "[t]he perception is that [producers in a part of the study area] had a bad experience because of lack of trust with administration, not so much for the coffee growing or the cooperative idea." Cooperatives tended to fail because of the need to compete with multinational corporations who were much better financed and able to hedge risks during the coffee crisis of the late 1990s and early 2000s. The multinationals often offered better prices, stripping away membership from the cooperatives, and leading cooperative management to take unwise market positions which they were unable to hedge. The failure of these strategies led to problems with liquidity and eventual organizational failure of the cooperatives.

In the absence of the cooperatives, the civic function of the industry was diminished, although respondents noted the social importance of the large national mills currently operating. Several have housing programs for their employees, programs to sponsor schools, and other community oriented programs. Moreover, these large national mills have played important training and employment roles. But, the cooperatives' closing accelerated the exit of small holder farmers from the industry, and they have not been able to build sufficiently strong organizations to replace their function. Not only did members lose money on harvests, but they lost the support of an organization that helped coordinate growing supplies, credit, and community support for farming.

Comparing CR Non-Prime Low Coop to CR Non-Prime High Coop, many interviewees expressed an opinion like the words of one producer:

> [There], they have…an immense cooperative, with lots of products and hardware stores. I think a cooperative here would be good, where the producer is a participant and a voter. The producer gets used to the idea that you just drop the coffee off at the mill and forget about the entire process until the final liquidation payment. In a cooperative they are more involved in what happens, in understanding what you do with the coffee, and how it is sold.

Before the coffee crisis, the many of the larger mills focused on volume, and several of the largest shuttered when the volumes here dropped, and those that were more aggressive tended to have heavy losses during the declines of the 2000. The surviving mills were farm based and had very deep capital support, or were less speculative, and slowly developed differentiated liquidation systems, and credit offerings for their farmers. However, these are extended cautiously, and the mills do not have the resources to build larger farm outreach systems.

Some of the producers' associations were born out of the failure of cooperatives and the coffee crisis. In the early 2000s, there was some price support in the crisis through government sponsored programs (i.e. FONECAFE), but in CR Non-Prime Low Coop many farmers took payments and, then, seeing that coffee was a losing proposition, spent the money on other things, letting their farms suffer and losing still more productivity, eventually quitting the industry.

Furthermore, because this region does not have a strong taste or quality reputation, there has been little entry into the higher echelons of the specialty market. There has been no micromill revolution in this cluster. As mentioned earlier, CR Non-Prime Low Coop has the challenge that, because of the climate patterns, coffee cherries ripen inconsistently on the same plant. Although yields can be high, and a sub-area of the case has a microclimate that fosters a distinct sweet cup profile, the ripening pattern makes production more expensive. Parts of CR Non-Prime Low Coop can require 12 harvesting events, whereas in the Prime regions harvesting is done on 3 or 4 occasions. This makes both harvesting and milling more expensive in the region.

The majority of the mills in the area that sell to exclusive niches are in the sub-region with the sweet cup profile. They are able to participate in Nespresso AAA, and market their best lots to important export brokers who control access to the most coveted clients. These farms are linked to the coffee elite, and they have both the social and financial means to develop brand identities in specialty markets. They also can invest in yields, and reducing transaction costs due to size, which is necessary because they do not outperform the best microlots in competitions, such as the Cup of Excellence. ICAFE sponsors a separate cupping competition that is region-specific at its annual international trade fare, and this allows these farmers to stand out.

Because of costs, and difficulty penetrating non-commodity markets, very few small holder farmers in this cluster have built their own mills. One who has taken the risk is a long-standing organic farmer originally from the US, who gave up formal certifications and now markets roasted coffee directly to the US. Another, who has opened a micromill and now exports through a specialty broker, had a long family history in export agriculture. Neither of these mills is in the most coveted sub-region, demonstrating the capacity for high quality coffees to grow at higher elevations throughout the CR Non-Prime Low Coop case.

The small producers that have attempted to become organic have had problems. The principal group started strongly, with over 80 members, and the support of a Catholic community group and MAG. But soon after its emergence, the group's founding members started to leave during the three-year transition period when they were not eligible to market their coffee as organic, thus qualifying for price premiums. Moreover, those who observed the process of conversion to organic saw yields drop by half, which meant that the producers had much higher per unit costs, and ended up losing money. Not being able to fill an export contract can mean losses and reputational damage for these organizations. This group eventually had problems related to credit and debt, caused by lack of expertise in the export process, and dwindling coffee production from members, leading to its demise. There is now another smaller group formed from some committed organic farmers, but they feel unsupported in Costa Rica's system. In their view, ICAFE decided organic was infeasible, and has given too few supports to farmers who want to use agro ecological approaches.

The fact that there is no integrated service provider, in the sense of supplies, knowledge, technical support, and credit at the mill level is a major deficit for the region. This made CR Non-Prime Low Coop's industry susceptible to coffee rust. For the small producers, the prices were low and one way they tried to make ends meet was that they "stopped spraying. Now coffee rust came, and it's strong and persistent." (ICAFE). There was a perception among agronomists that low prices had led farmers to skimp on antifungal pesticides and fertilizers, which opened the door to coffee rust blight susceptibility. Those whose plants have resisted the disease are the larger estates, according to the manager of a mill that buys from small holder farmers:

> they always stick to an established agronomical program. They are also affected by low prices, but they don't stop their agronomical plan, they don't break that cycle, for example spraying against pests, they always do it. The small producer is more limited in this sense. They depend on yearly prices and on a forward payment. If that upfront payment is not enough for farm work, they just don't do it sometimes. Some only fertilize only once, twice, others three times.

This region lost half of its production from 2012 to 2014, and rebounded to 70% of pre-coffee rust levels in 2015. However, this was one of the worst recoveries in Costa Rica, significantly lower than its comparison case, and caused the further decline of small-holder production in this region.

8.6.2.1.2 Relational

The difficulties faced by the local industry have reduced the number of actors in the network, and discouraged the formation of common cluster institutions that could coalesce local action, and knowledge development. Those firms who have persisted have displayed high capacity for absorbing knowledge, self-financing, and network building with external actors. Many of the owners of the estates are based in San Jose, and participate in the Coffee Chamber, and deal directly with exporters. They are less involved with specialty institutions, which tended to develop around the interests of the prime areas, but the larger mills are now becoming more focused on this market, which they entered first through certifications. The process of upgrading for one large farm, which has hundreds of hectares over various elevations, led it to realize that it had high elevation parcels which could produce distinct profiles, and allow it to sell microlots at the same time it maintained it broad focus on volume-oriented certified coffee.

Among local mills, respondents reported cordial relationships, but they tend to evolve in cliques, based around homiophily and proximity. Two neighboring mills with different commercial strategies reported that they constantly visited each other, and toured new projects, as well as consulted on market and agronomical issues. Of the smaller mills in this cluster, they tend to talk to larger mills, not to each other. Unlike in the prime High Cooperative case, where there is a clear model for micromills, the newer smaller mills in this area are not clustered and have pursued divergent business models.

The export arms of multinational firms were especially important in this region, due to the social connections of the estate owners and the lack of export focus of the larger mills on exporting. This is to say that comparted to other areas, few firms had vertically integrated into exporting. This lack of institutional export orientation appears to be a function of the difficulties of farming in this region, such that firms and their non-local owners concentrated on productivity, and then used contacts with export firms to find buyers looking for larger shipments of certified coffees, and coffee of uniform quality from lower elevations, which tether the price more closely to commodity markets.

For small holders, few certification organizations seek to support their farming, or assist them to upgrade or invest, so ICAFE plays an important role in CR Non-Prime Low Coop, potentially more important than in areas with stronger producer firms. However, ICAFE has limited staff, which has been cut given the drop in regional production. Despite this, many mills reported positive working relationships:

> The office here was not so good, now it's better, because there is less coffee in the area, and they have to look after their work so the regional office is not closed, they have to try to improve the area. They have always worked, but now they are in the field more. One used to have to call and make an appointment. Now its immediate. The regional office comes in 10 minutes or the next day.

With other government agencies, relationships were less developed than in other areas. MAG for example, was involved with organics, but these projects did not prosper. Both MAG and ICAFE have collaborated on the topic of coffee rust in the area because of general fund support.

The other distinct feature of the relational networks in this area is the important role played by a graduate research and education institute, CATIE (Center for Research in Tropical Agriculture). CATIE is a leader in coffee research, and runs a 40ha farm and mill, with many international research projects, which spill over into the mills of this region. One estate mill whose owners are linked to international NGOs, houses a constant cycle of field experiments, especially on issues of coffee and sustainability, but farmers also use the CATIE farm to access new varietals, and for consulting on milling.

What is missing in this cluster are common institutions and development goals. The mills interact with each other in terms of their businesses, but the region is more of a problem for the farms. There has been no common effort to improve the reputation, beyond farms upgrading within their own business models, and their own market reputations. Coffee from the best growers is identified by the estate and not the region, and there is little interest in working on a common reputation among these firms because they believe branding with the name of the sub-cluster will only hurt them.

8.6.2.1.3 Spatial

This case has felt the loss of mills and farmers. There are no common areas where coffee infrastructure is centralized for a large network of small holders. Most of the towns no longer are coffee oriented in the same way they used to be. Furthermore, as mills continue to close, there are less and less opportunities for small holder farmers, and less competition for coffee. Furthermore, much of the remaining production is spread out and interspersed with other crops. These factors make developing a regional reputation difficult, and providing services for small holder producers harder. Those who can persist in this environment, are, for the most part, actors who can internalize knowledge networks, resource access, and administrative costs. Because the organizations that govern the cluster are spread out into smaller and smaller disconnected areas they struggle to create a common network.

8.6.3 Costa Rica Non-Prime High Coop

8.6.3.1 Institutional

The Non-Prime High Coop case in Costa Rica is Perez Zeledon, which has suffered from much of the decline that its pair, CR Non-Prime Low Coop, has experienced. Perez Zeledon is a heterogeneous region with many different microclimates. Farmers in lower elevation areas have sometimes switched to other crops, and coffee production has suffered. Many farmers switched to pineapple, and later to grazing fields and sugar cane. Some larger farms on flatter areas were sold to multinational companies that trade in crops other than coffee, such as Del Monte. Coffee production in the region declined quickly in the early parts of the 2000s, but in the period after 2004, land use change stabilized, at least when compared to the Non-Prime Low Coop case. Moreover, this case has maintained much of its industry structure, although three large private mills closed and two multinationals exited the area. To some extent, these closures have been better absorbed in CR Non-Prime High Coop, because the area is served by one of the largest cooperatives in Costa Rica, which processes large amounts of both sugar and coffee.

The presence of this large organization is a support mechanism to the social relationships of the region, and may provide a model for other organizations. Much as in the CR Prime High Coop case, many in the industry have work histories with the cooperative, or were once part of a member family. A competitor described, that, as mills, cooperatives work the same, but:

> They are focused on providing services to people. They have supermarkets, gas stations, a credit union. They give their members lots of

> services, and many people see this as a benefit. If they need credit, the cooperative can give them a loan, like a bank, and they can pay it back in coffee or sugar cane.

The mill plays a very important position in the entire region, also engaging in sugar production. Thus, during the year they can contract over 600 people with temporary work, and these are often members who use the supplemental income. They act as a key intermediary for promoting agriculture in the cluster, not just coffee, although this is their core mission. For example, they were one of the first organizations that the Cost Rican government contacted when it was developing a system of ecosystem payments in agriculture. Participating in certifications, such as Fair Trade since 2004, helps provide a more complete range of services, and to reduce the use of the worst agrochemicals, it also helps them support a larger nursery to provide farmers with plants for renovations, and projects to switch to organic fertilizers that are processed in the company's mill. They have taken on a range of projects in conjunction with environmental NGOs, MAG, and ICAFE to educate farmers about more agroecological approaches to farming that cut costs and protect soils, while at the same time providing steady financing options to enable farms and farm families, and to continue operating.

However, this support network does not protect producers from low prices, and environmental challenges, and the area faces similar problems to CR Non-Prime Low Coop, because there are few protections for producers from the market, which affects marginal areas, especially those with farms below 800 meters, or even 1000. As the owner of one private mill recounted:

> The problem is that coffee [was its own thing], [it] was never very dependent on the government, now it's a little different, but still the

> industry has dwindled, both in hectares and yields. Producers are getting more and more disheartened every day because of low prices. Many of them have taken on personal debts to get by from harvest to harvest.

The non-cooperative mills compete on upfront prices, and easy financing. Many farmers do not like the pay schedule, or administration fees of the cooperatives, especially if they can find higher prices at moments of high prices. However, for larger mills this was a zero-sum game because of an annual bidding war hedged against world markets. One private mill recently entered the area with used milling equipment, and a Coffee Quality Institute Q-cupper (certified coffee taster and quality grader), low overhead, and a strategy to outbid other mills, carefully sort lots, and strategically seek out buyers in times of the year when there is less of a price spike, or when there is less coffee on the marketplace by strategic arbitrage in different times of the year (the long-term efficacy of this strategy is unknown). Along with financing for harvest and fertilizers, and payment up front is appealing to farmers in vulnerable areas, even if it comes at the price of a support structure for long-term farm management.

Due to the problem of developing upgrading projects with small holder farmers at the margins of industry exit, only one large multinational operates in the cluster, and it has not targeted the area for buyer driven certifications, and the absence of these programs meant that they did not offer in-field technical support. But the need to develop a more reliable supply chain, and problems with quality when farmers underinvest, led them the multinational start offering access to the same technicians and support as in the certification programs at mills in other regions to a small group of farmers in this region. In 2013 they began a 4C certification program (which is the least selective certification) with small farmers representing around 20% of their volume, and medium to larger farms making up the rest.

Farmer support programs are both more important and more difficult in the Non-Prime cases, because the region's reputation lacks a well-recognized position in the market. A local ICAFE representative summarized the regions model as "[good] quality, standardized coffee, at high volumes, and lately there has been more differentiation." Mills have also responded by creating differentiated lines for coffee grown over 1000 or 1200 msl. All but one mill applies this strategy (this mill mixes its coffee, but pays an elevation premium). The differentiation strategy is much more prevalent in Non-Prime areas, and acts as a sort of price-support system for higher elevation producers, but it may exacerbate the problem for lower elevations.

Within this context, price alone has become an insufficient competitive strategy for resilience in a period where prices are frequently so low that they continue to push producers out of the industry. But because many farmers in this area are economically stressed, there is also a set of producers who respond to short-term prices. Mills are faced with the conundrum of developing programs to make longer term higher risk investments in farmers, which may eventually lead to better coffee and higher yields, but could lead to losses, or competing on price, and risking that another mill outbids them risking volumes.

In terms of support, cooperatives have an advantage, at least in experience, in providing full technical services to small holder farmers. They help them with government support, when available, and with farming assistance. The largest cooperative has several agronomists, a credit program for replanting, and a department dedicated to helping farmers get environmental payments for forests and shade trees; in addition, it operates a warehouse with subsidized materials. They have an advantage with these activities as a tax exempt organization. The largest cooperative is a Fair Trade certified organization, which is the only large mill in the area offering a certification. Fair Trade is important for lower elevation producers, because it carries a price bonus, and is less attached to the specialty market, and does not require the loss of yields associated with organic coffee.

Another cooperative in a more remote part of the cluster has operated for 30 years; it formed because it was too far from the principal one for its members to be represented. They are in a lower elevation area, but have worked hard on supporting their members in terms of diversification and technical assistance. Both cooperatives attempt to develop farming strategies and practices for farmers to maintain yields and quality.

In this region, MAG and CNP (National Production Council of CR) were both very active in supporting smaller mills, and producers' organizations. For CNP, this was an outlet as its core mission has shifted from one that centered on running distribution centers for the purchase and sale of national agricultural products, to one that helps foster local markets and agricultural adjustment. One of their strategies has been to support local agricultural identities, trademarks, and marketing strategies. These joint efforts by MAG, CNP, and ICAFE provided technical assistance in farm management, and marketing in agricultural supply chains to farmers groups, to whom they also provided equipment and funding for small low-water mills. Alongside this came the support of new small producers' associations such as Mi Café Brunca. The idea was that with initial support smaller producers' associations (or small cooperatives), often far from the largest cooperative, could improve environmental management, and together find new markets for their coffee.

Nevertheless, producers' associations have had little capacity to operate after receiving start-up grants. One member recounted:

> We have tried to learn through people in this area, [a neighboring private mill], for example, has helped us in the milling part, MAG too, but it's been hard because we were farmers and we knew nothing of the business side.

Where these organizations and other micro mills have been successful is in filling niches in specialty markets, and several roast coffee under small house brands for domestic sale. A local official emphasized that the area's focus was good generic quality and high volume, but noted that:

> Small mills have directed efforts at certain micro-origins, varieties, and microlots. Not only to separate the coffees but to market the coffee, expand the market, and place it in specific niches where these types of coffees are valued.

Several of these mills are now part of the networks of premier specialty, and microlot brokers, and have broken into the Cup of Excellence competitions. There are also several small producers' associations growing organic coffee, in very excellent microclimates. These groups also exist in the neighboring Prime High Coop region, but they do not sell organic. Here it may be a strategy to overcome reputational issues, where the cluster overpowers the microclimate. These associations have been more stable than groups in the Low Coop area, which were not based out of a high elevation microclimate. Groups operating at lower elevations have not achieved stability.

Partly because growing conditions are so diverse, regional strategies in this case have been slow to evolve. For example, the organizations associated with Mi Café Brunca were too diverse to develop a common export, or marketing strategy. Although in general most respondents recognized the need to collectively improve the region's coffee to compete in markets, there was skepticism about ICAFE's denomination of origin program for two reasons. The first was that ICAFE had placed them together with a neighboring region, to which one interviewee responded, "if they lump us in with them we're stuck. That region goes from the [high mountains] to the [national border], … we are three different zones, at least." In addition, some producers from high elevations think associating them with a denomination would prejudice them: "…we already have the problem that they buy our best coffee at plus $15 and mix

> **ICAFE and Coffee Rust:**
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> As much as the GVC perspective puts emphasis on upgrading. Basic coffee governance must not lose its capacity to protect basic production. An example of resilient governance is ICAFEs response to coffee rust here. In light of the coffee rust problem in this region, ICAFE has tried to promote replanting with Venecia and Opata coffee variety, which has an acceptable cup profile and is coffee-rust resistant. As part of Costa Rica's declaration of an agricultural emergency, ICAFE sponsored an extensive outreach program, which includes access to credit on favorable terms, an early warning system, distribution of fungicides, and a replanting campaign for the most effective crops. However, this area was the most climatically vulnerable to rust of the four Costa Rica regions studied, as well as being an economically vulnerable area, because of underinvestment. From 2012 to, 2014, production dropped by 48 percent, but by 2015 it had significantly rebounded 95%.

it with [prime areas] that get plus $50,". Nevertheless, other groups, those from lower elevations, think that it could help because, "coffee here has a bad reputation, but it's not bad, and we could focus on developing quality." At the time of my interviews, none of the public actors, or private mills, were involved in the denomination of origin project, and most prioritized strategies for stabilizing production.

In 2010, in a period of higher prices, Banco Nacional started a renovation program to provide accessible credit to smaller producers to renovate their farms. In Non-Prime High Coop production dropped faster than land use change, and these programs were meant to counteract a decade of disinvestment due to low prices, which then led to low yields. (ICAFE interview). These types of sponsored programs are necessary because milling organizations are unable to give long term financing. ICAFE is central to these efforts, and has a regional office, with its own experimental farm. They also sponsor industry fairs, training courses, and projects. Smaller actors noted that it was easier to work with them on group projects, but that the problems felt in the industry created motivational impediments for groups to come together.

Groups with different production models had different perspectives about ICAFE's role, especially organic producers. From the perspective of organic cooperative producers association, ICAFE offers few solutions:

> They don't promote organic, there still has been no promotional policy. Yes they help. They help us like any other producer, but they think it hurts yields too much to change.

This is understandable given that organic is less than 6% of total exports, but this segment of the market is slowly growing, and with that growth institutions are slowly shifting from an exclusive focus on Costa Rica's technified model, to a more balanced approach that also develops capacity to support alternative networks.

8.6.3.2 Relational

Many organizations here felt that their area was overlooked because of its distance from San Jose. They complained that few universities came to help, and that most attention was paid to the star regions. This represented an interaction between the spatial location of the cluster and its relational components. The largest cooperative, because of its size, has developed projects with some international NGOs and conservation organizations because of its work on forestry. The smaller cooperative in the region has also been effective at obtaining funds for local development projects, especially diversification and multi-crop systems.

The largest cooperative has been much more involved in export since it started to sell Fair Trade coffee. They have built stronger relationships with purchasers, especially Fair Trade brokers and purchasers in Europe. Because of these relationships, they are now much more involved in preparing blends to order, and coffees with different profiles. Most of the smaller producers' associations grow organic coffee, and are part of a second-level export organization called La Alianza that manages the Fair Trade certification for the group of organic producers. Only one of the smaller Fair Trade and organic groups in Non-Prime High Coop had direct contact with buyers through the work of its president as a coordinator with the larger collective. In general, smaller mills reported barriers, including language and location, in terms of accessing the value chain. Several smaller private mills are advised by specialty export brokers, but even though they are developing coffee from micro lots, only one mill had consistent contacts with final purchasers.

As noted above, collaboration exists among small networks of mills. This contrasts to the Non Prime Low Cooperative case, and follows the Prime High Coop Case. The cooperative producers' associations tended to talk and work together, and were facilitated by La Alianza, and they also shared information and experiences with the private micromills, through Mi Café Brunca. As in the Prime High Cooperative case, the MAG-sponsored small mill association has not been successful in its efforts to create a dry-mill and export platform, but many groups found the association useful especially in terms of learning about issues, such as cupping, and the greater coffee value chain. Here the institutional change is important for creating a relational space for new types of mills and innovative strategies in the region.

8.6.3.3 Spatial

This case covers a very large single municipality, so even the largest cooperative, one of the largest mills in Costa Rica, has trouble covering all of the territory. Another smaller cooperative operates in one sector, as well as a series of private mills, and since the late 2000s over a dozen producers' associations, and micromills have appeared. Most of them are in one part of the cluster with a special micro-climate, but

The region is also a more peripheral region historically in terms of its geographic distance to San Jose (driving there can take almost 4 hours on the Pan American highway, and requires crossing a large mountain range), which means that most exporting firms and finishing infrastructure are in the Central Valley. One example of this is that most independent mills in the area send their coffee to be dry milled at a single large dry mill, over an hour away, which is in part owned by a large cooperative. It is an example of a cooperative needing to invest in infrastructure outside of the region for logistics reasons. However, one smaller mill in the area recently invested in dry milling and selecting technology, and hopes that it can mill for smaller groups. How this will work within the context of Costa Rica's existing transport and logistics infrastructure is unclear.

More isolated areas with potentially equal growing conditions to the best areas in Costa Rica have participated, but at a slower rate, and later, in the highest echelons of the specialty market. This may be because of the lack of spillovers and access to exporters in

San Jose. For coffee, as in wine, it is harder to be a small area of exceptional quality, within a larger less favored zone, than to be part of a larger premier region. Markets will seek out high value coffee, even in remote locations, but will do so later and more slowly than in areas with easy access, and many arbitrage on the price.

8.6.4 Comparison of CR Cases

In Costa Rica, the Prime Cases and the outcome data described in Chapter 6 together provide support for hypotheses H1 ("Clusters with strong cooperatives will be relatively more resilient"). The High Cooperative case there has retained more production and land use, and the data from the cases suggest that the cooperatives played a role in this. The Non Prime cases both suffered large land use losses, but these were eventually attenuated in the High Coop Non Prime case, and there was clear evidence of resilient reorganization both by the cooperative and in higher elevation areas.

There is less clear evidence support in the comparison for H2 ("Cluster resilience will correspond to areas whose institutions encourage value chain upgrading"), because similar processes of upgrading happened in each case, but in the High Cooperative case many locally embedded mills, especially the cooperatives, led this process. Moreover, the High Cooperative case saw more micromills emerge, and the creation of organizations to represent these mills and to actively defend the reputation of the region in global markets. A similar story played out in the Non Prime Regions, and there was more evidence of new organizational strategies to find value and create resilient solutions for small farmers, such as organic farms, and the creation of Mi Café Brunka.

In terms of the Relational hypotheses H5 (“Cluster resilience will correspond to stronger social networks and social capital within the cluster (akin to bonding capital)”), I did observe stronger networks of knowledge sharing among mills in both the High Cooperative cases, and greater instances of collaboration. The only case where collaboration was clearly low was the Prime Low Coop Case. Part of this may have been due to the greater density of mills in the cluster, which supports H8 (“Resilient areas will benefit from the industrialization economies provided by greater concentration of industry infrastructure and intermediary organizations.”), but in general my interviews suggested higher levels of trust and sense of a collective identity in the High Cooperatives clusters, as well as embedded social networks that intermingled family, friendship, and the coffee industry.

Because the Prime Low Cooperative case had greater connections to metropolitan San Jose it was in some ways more open in terms of H6 (“More resilient clusters will have more open knowledge and collaboration networks (akin to bridging capital).”), but at the organizational level, I observed the most collaboration and external exchange in the Prime High Cooperative case. There were private mills in both the prime cases and in the Non Prime Low Coop area with strong GVC savy and connections, but these actively engaged in knowledge building and sustainability from the cluster, and not from central offices, thus bringing more external actors to the area.

In terms of Spatial hypotheses H7 (“Resilient areas will have better access to labor pools and transportation networks.”), it is possible that the Prime Low Cooperative case had transportation advantages, but suffered from the dilution of its labor pool to the metropolitan area. Moreover, mills with less capacity in the Non Prime High Cooperative case, which is distant from the city, had more difficulty connecting to the GVC and to sources of knowledge, which made the role of the large cooperative particularly important for the cluster.

8.6.5 Mexico-Veracruz

Veracruz was once the heartland of the traditional Mexican coffee industry, and the INMECAFE model. However, many of its largest mills and organizations failed in the 1990s, and what remains bridges

In Veracruz the AVERCAFE and the Veracruz Coffee Council represent producer organizations, but these state-level entities have questionable buy-in, and while they persist to organize the voices of member organizations and producers, they have not significantly affected the balance of power in the industry. Governance has also been unstable. In the mid-2000s the state set up a state coffee board, Veracruz Coffee Regulatory Committee, with the aim of creating a geographical identifier (denomination of origin) for high quality coffees. They were funded for a lab and staff, but the program never fully took root, although they did offer important lab and training activities. Many people I interviewed have questions over the use of funds, and the state government eventually took away funding in 2014, during a larger budget crisis, before the idea of a denomination of origin for the state had a chance to gain a foothold in the value chain. The state replaced the Regulatory Committee with a marketing campaign aimed at positioning Veracruz coffee in specialty markets, and effectively removing the element of internal industry development and cohesion around common standards.

8.6.5.1 Veracruz Low Cooperative

8.6.5.1.1 Institutional

The structure of the coffee industry in this cluster is the product of success in past paradigms. Coffee in this region was dominated by a series of large estates, which were slowly broken up, but not entirely, and were at one time the center of the INMECAFE production model. In fact, at one point, the central offices of INMECAFE moved from Mexico City to the capital of Veracruz, adjacent to this region. Several large state-owned mills existed, and many private mills sold to INMECAFE, which also had a strong extension presence. However, the dissolution of the state-ownership model, left large farms whose owners felt progressively less attachment to coffee as the industry became less profitable, while opportunities related to urban industries and development grew. For small holder farmers, the loss of INMECAFE left a large gap in a period of vulnerability, which they were unable fill the gap by organizing into cooperatives. In part, this had to do with the desirability of the region's coffee, and the presence of private capital, as a series of private national mills, many attached to farming dynasties, and multinationals came to dominate the cluster's production.

Multinational mills, and large private national mills in this region receive 80%-90% of their coffee through purchasing agents (*coyotes*) who work on commissions, and buy coffee at spot prices, normally controlling the coffee of an average of 50 producers. When these purchasing agents are captive to a mill, they can be motivated to help with providing assistance, and in some cases coordinating with technical staff to organize certification processes, but there are others who arbitrage among different mills, and shield their farmers to get them the best prices. As one mill representative explained, "Some purchasing agents are very jealous of their producers. They won't let you know them because they think they will lose the contact. They have high profit margins, and it's not to their convenience for the producers to be involved, because lots of purchasing agents (*coyotes*) sell to different mills. There is no exclusivity."

In part because of this, few farmers in this region have engaged in value chain driven upgrading aimed at export and little coffee meets standards for certification. Virtually no coffee is certified Fair Trade, and, while there may be a limited number of organically certified farms, virtually no mills are engaged in group certifications. Two firms I interviewed are involved in the Nestle 4C program or UTZ (with one starting the program for 4C the year of the interview), but few offer the full services associated with producer cooperatives or producer groups. Several mills offer a mix of financing, agrochemical products, and technical advice, but not the type of integrated field support seen with certification schemes. In the absence of these mechanisms, only a minority of farmers have access to strong support services. The largest multinational operates a high-tech greenhouse, and offers field services from licensed agronomists, but extends these services to less than 30% of its farmers because of costs and the intermediary system.

This is not to say that public and private actors have not made efforts to create new forms of value chain organization in this case. A past effort, PROCAFE sponsored by FIRA, between 2005 and 2008, attempted to organize producers' groups at the *ejido* level and give them training in good growing practices, knowledge about coffee quality and how to evaluate their harvests. However, the projects came without commercial guarantees, or working capital, and were unable to convince many growers to break away from the intermediary system, or make the investments in fertilization or improved harvesting, necessary for the specialty markets, especially at a time before small "direct trade" enterprises had fully established themselves in the US and Europe. The project had only one engineer and promotion agent, and while it covered more than a dozen small organized groups, there were no actors in the region willing to pay prices that compensated this work. Self-organization for farmers with few resources proved impossible, because, as one producer related, “there is much distrust among producers, and it prevents them from sharing.” In the end four small groups survived, and they sell to a mix of multinationals, large national firms, and in some cases, national specialty buyers.

A coffee advocacy group at the regional level, which represents over a thousand farmers, works on providing help with government programs, financing, training, technical assistance, and agricultural and life insurance. Originally they started as a cooperative, but after starting with 300 farmers contributing coffee in the mid-2000s, they faced problems on the commercial side and ceased operations, but continued as an organized group. They then started a smaller cooperative effort, and they have rebuilt their model around specialty lots coordinating with INECOL’s Oikos program, and they have only recruited around 100 farmers. In 2013, they produced less than a container of coffee, which in many ways precludes them from exporting, but they have could sell to Mexico’s large internal market at competitive prices, and are recruiting more farmers from the larger group.

To do well in the specialty market without strong support mechanisms requires internal capacity. Some estate farmers have developed micro lots, and one large multinational buys harvested coffee from farmers at above 84 points on the SCAA scale. Moreover, the engineer from the Procafe project continued with specialty coffee on his farm, which was used as a demonstration project. It is now one of the few successful micromills in Mexico, and continues to be a reference for the industry, although few group projects exist.

Efforts to expand this model have been slow, in part because of the lack of effective systems, such as Cup of Excellence, for demonstrating high quality at the national level. Regional actors, ranging from NGOs to multinationals, have sponsored cupping competitions to highlight and publicize quality coffee from the region. Following the failed Procafe project, a local university-linked coffee development NGO, affiliated with a larger project of development groups and researchers (Café in Red), took on the responsibility of providing training and support for small holder farmers to enter specialty markets. They have supported farmers who are among the first specialty-oriented smallholder micromills in Mexico, and hope to provide an accessible quality and environmental certification, Oikos, for these farmers. This was developed by an NGO (CAFECOL (Ecological Coffee)) associated with INECOL (Institute for Ecology (a Veracruz research and graduate degree granting body)).

In the long run this effort is aimed as an export option within direct trade channels, but early adopters have not exported, in part because Mexico has a growing demand for specialty coffee and a large internal market which can absorb their supply, and because the kinds of specialty exporters that are prevalent in Costa Rica do not exist in Mexico. One firm has developed brands of regionally identified micro lot coffee, but they are an integrated coffee shop supplier, who sell principally in Mexico City, Guadalajara, and Monterrey, Mexico. They purchase high quality coffee, often paying 50% premiums or more over conventional prices, but only in very limited quantities.

While most specialty channels do not come with farmer support mechanisms, there are many commercial channels within Mexico that provide opportunities for farmers in Veracruz Low Cooperative and many have started to sell coffee directly, because the location of the cluster and its reputation offer a strong platform for national sales. Accordingly, the national market is the area with the greatest development of a link between specialty coffee consumption and production. Several of the coffee towns in Veracruz Low Cooperative are beautiful examples of traditional Mexican architecture, with colonial buildings, markets, and vibrant tourist activity. Specialty boutique coffee shops have emerged in this environment, as have several projects to integrate agro tourism, including estate tours, and tours of local micro-roasters, which include cuppings. The main city in the cluster hosts a coffee festival. As innovative as these activities may be, they do not represent the institutional reality of most farmers in the region, who are unable to produce specialty grade coffee and who remain fully a part of the intermediary system.

There is a lack of producer trust in the long-term future of coffee in Veracruz. Because of this, farmers invest less in fertilization and other management activities, which has the dual effect of lowering yield and quality. Thus, mills are faced with competing for less and less coffee, and with producers who are unhappy because they are getting lower prices due to having coffee of lower quality. This led one of the two multinationals with a mill in the region to close operations at its wet mill the year of the interviews.

8.6.5.1.2 Relational

Veracruz Low Cooperative is a traditional coffee bastion, once configured by large estates that supported the region's economic elite. This old elite-center system has substantially informed relationships. Relationships in Veracruz Low Cooperative were the most closed; the most powerful estates and private mills are controlled by long-standing families, who are linked by friendship and family ties. Many of the private mills exchange commercial information, and technical ideas, but few respondents reported any relational activities related to cluster development. There is a fair degree of trust and communication in this network, but each company pursues its own internalized commercial strategy, with very few engaged with public agencies in activities to support upgrading, or programs to support growers.

One large multinational operates multiple wet mills, a dry milling facility, and a large nursery near to this cluster. They have been the most active in terms of developing programs to support farmers, and offer certifications. These have grown to handling over 20% of the coffee purchased in this region, principally though UTZ and 4C via larger farmers and purchasers with whom they have stable relationships, allowing outreach through a sustainable services program. This company is involved in a global research network, and has far more knowledge and financial capacity than any other group. The company also collaborates with local educational institutions. They, along with a regional producers' group, which is working on projects to improve quality, and provide support for farmers to invest in their farms, are the only groups with regionally grounded networks to knowledge and resources that connect with small holder producers.

There is a very active coffee research culture in the region, thanks to nearby universities, which have sponsored regional development projects, including Café in Red and Biocafe, which have involved national networks and funding. However, these are not territorially embedded in a shared culture at the cluster level.

Interviewees in this region were very mistrustful of SAGARPA, and especially the state agricultural agency, SEDARPA. The old order of the coffee elite is much less invested in the industry than in previous generations, and small holders have not been able to mobilize for collective action. Some initiative has come from the research segment, such as CAFECOL and Café in Red, and regional producers group and multinationals are present in the latter network, but there is no larger forum for development of strategies to improve regional reputations, or to systematically improve support for farmers. In the face of this reality, the coffee industry in Veracruz Low Coop has continuously atrophied, producing a negative self-reinforcing effect on local cluster networks.

Coffee rust was just evolving as an issue when I interviewed here, but there was no clear working group, and since then 80% of plants in some areas of the region have reported damage, almost entirely among small holders who had older undernourished plantations (Perez 2016), drastically reducing production. The lack of local institutions representing these farmers means that, for example, few nurseries and organized replanting programs have been undertaken. The largest multinational has a large nursery and outreach programs, as does the producers' association, and mills with certifications, such as 4C, also have assistance programs, but this leaves the majority of farmers without support, and many interviewees complained that the suppliers of rust- resistant plants were not always reputable. For example, municipalities, who have never been involved with coffee, have filled the gap in the value chain in this case to create nurseries, but the effectiveness of their programs is still unknown.

8.6.5.1.3 Spatial

Proximity to the state capital has increased land values near the capital and pushed much production to the more remote areas of this region, and interrupted the spatial coherence of the industry. Large sections of coffee cultivation have been lost to a mix of urbanization and attrition because of other opportunities. This has diluted the capacity of the local industry to take advantage of economies of scale. However, one advantage Mexican producers have is that Mexico has a much larger internal market than do many other producer nations. Accordingly, roasting is an important activity for several of the private milling firms. Moreover, in areas nearer to cities in Veracruz, several coffee elite families have started successful café chains, which serve as value-added strategies for their farms, and for coffee purchased at the mill. These chains, and regionally roasted coffees, also have expanded to larger cities, such as Puebla, D.F., Guadalajara, and Monterrey. Even for small farmers, proximity to markets, has meant more and more are roasting their own coffee.

8.6.5.2 Veracruz High Cooperative

8.6.5.2.1 Institutional

There are a number of cooperatives in this area, as well as a series of organizations which do not collect, mill or sell coffee, but exist to organize for agricultural support programs. Hernandez- Rodriguez (2013) observed that 2,500 farmers were members of the

5 organizations that sell coffee, out of just under 13,000 regionally affiliated to the non-value chain organizations. My own observations found that the number of groups selling coffee is slightly higher than this, at least five groups are in one newly-formed commercial alliance, which formed with the help of French roaster Malongo, after the collapse of another second level cooperative REDCAFE (distinct from the research effort Café en Red), which operated at a multistate scale, as well as two other more independent cooperatives operated out of the main city, and three smaller groups selling small amounts of coffee through more informal channels, or to multinationals. One of the organizations in the block of unified smaller groups, has begun a NGO focused on integral coffee training.

Broadly speaking, the cooperatives are divided into the smaller ones grouped under the new export alliance, and two slightly large ones. These traditionally were larger organizations, and during the 2000s, one developed important programs related to organic coffee and Fair Trade certification. They engaged in many environmental projects, and were an importance presence during the coffee crisis. Since 2012, they appear to have had significant problems related to lower prices, and are significantly less involved in external projects, but still sell Fair Trade certified coffee. Another group sells organic and conventional coffee, but is not certified, although this group has focused more on developing cup quality among its producers, originally sponsoring workshops for Oikos certification with CAFECOL, and placing very well in the Mexican Cup of Excellence, in conjunction with another local mill.

Five national milling groups operate in the area, as well as at least 6 other mills that purchase coffee. Two other multinationals operate here purchase around 10% certified coffees from larger farms, but do not sponsor certifications themselves. One works through a combination of purchasing agents, and local contracted mills, and the other has purchasing agents from mills in the region, but focuses on large farms. Several other private national mills work with certifications, most commonly Nestle's 4C, and to a lesser extent UTZ, and these mills export coffee and sell domestically.

This cluster has more development than Veracruz Low Coop in terms of the higher volume specialty industry. It is home to a series of very reputable estates, which, while they specialize in higher volume production, have produced micro lots, which have consistently placed at the high end of national cupping competitions. This is the only area in Mexico with a Nespresso AAA cluster, and it was selected because of the inherent cup quality, but also the availability of producers willing and able to improve their practices to meet quality standards.

Outside the cooperatives, much coffee in this cluster is certified. Several of the larger farms have certifications; the largest mill operates a Nespresso AAA cluster (the only one in Mexico) with over 1200 producers representing more than 60% of the volume in that municipality. This organizational case is treated by (Saavedra 2014). The AAA producers are organized under a group Rainforest Alliance certification. This mill has more staffing than other multinationals in the region and offers more services, but most of the staff is located in a Hub office near to Veracruz Low Cooperative, although they employ several agronomical engineers in this region and other support staff for the AAA program. However, most of their research and administrative staff is in a hub office, from which the they operate a large dry mill and one of the largest nursery's in Mexico. Thus most of the knowledge based staff is based outside the cluster.

While most coffee is sold through purchasing agents, there are many more opportunities for credit, supply, and technical support for farmers than in Veracruz Low Coop. This is the result of much greater firm capacity, but this has not led to a comprehensive regional approach to upgrading. It does mean that there is greater institutional support for the cluster. For example, AVERCAFE, which is responsible for the administration of commercial elements of Mexico's coffee sales system is located here, but few interviewees felt they had a positive effect.

Mexico's national agricultural university, Universidad Autonoma de Chapingo, has a branch campus in this cluster, UACH-CRUO, which has long carried out important research, and has engaged in important capacity building projects with farmers in the region. The center recently was awarded a National Coffee Research and Development Center (CENACAFÉ), which should provide additional impetus for technology transfer and innovation.

This region, shows promising signs of innovation, and smaller projects to support alternative farming solutions. The region has also retained medium and large farms that produce high quality coffee, and have made investments to improve yields and modernize. Furthermore, the Nespresso AAA cluster appears to have brought additional outside investment to support farmers in part of the cluster. This case is, however, still susceptible to many of the problems endemic to small holder coffee in Mexico, in that there is not a strong way to provide support for small holder farmers. As such, the area was vulnerable to coffee rust, although there is some evidence from my interviews that larger producers, and smaller producers in programs aligned with cooperatives and thus more active in on-farm investments, suffered less losses, and have had more access to opportunities to reinvest in new plants. However, news reports from after my field period suggest that both Veracruz Low Cooperative and Veracruz High Cooperative suffered greatly.

8.6.5.2.2 Relational

Not all of them have collaborative or learning relationships; notably, the two largest cooperatives in the city, while important actors, were not strongly associated with collaboration and industry development. The leading smaller cooperatives in the commercial union are active in collaborating, but they are small players, assisted by an external buyer. To some extent, the largest multinational depends on its long-term relationships with Nestle to engage in long-term farmer support programs, although it is also able to use international networks and resources to leverage larger scale programs with major multilateral institutions, such as the World Bank's IFC.

Cooperatives in this region have access to social lending institutions, such as Root Capital, which offer capacity building, but the scale of financing is much more limited. Some have benefited from SAGARPA's financing in conjunction with Mexican public agricultural finance bodies (FIRA, FINDECA, and Financiera Rural), which provides support for extensions with credit programs. Larger private firms also do, but this was the channel where government relationships seemed most valued. Beyond this, very few actors saw SAGARPA or other public or quasi-public coffee institutions as key allies in terms of developing the industry.

Many of the regional firms had strong links to local business networks and banks, and were able to use events, such as SCAA or national congresses, to reach out to purchasers. While more coffee was certified here, the certification process itself was not key to their commercial strategy, except in the case of Fair Trade, a useful benchmarking system. The larger estates and private organizations also tended (as they also did in the other Veracruz and Chiapas cases) to internalize learning, and contract for external (often international) expertize in growing, or make strategic trips to learn from innovators in Brazil or Colombia when they wanted to learn about best practices. Several of these larger farms were references in the region, with other actors reporting them as sources of knowledge, and sometimes specific services, but they were not open collaborative relationships. Many actors reported being in social and friendship networks with their peers, but there was a split between mills who saw their operations as a solo competitive enterprise, and those who had more regional interaction, with smaller undertakings tending to display the latter strategy. Furthermore, when mills did report more active collaboration it was often with multinationals with whom they had commercial relationships.

Even though this case was selected as High Cooperative, this is a relative measure, and the leading firms in the region are private. Cooperatives in this case were not knowledge and information brokers for other mills. Where cooperatives had influence was with university collaborations, especially with the local branch of Mexico's agricultural university, and with Cafecol, discussed in the other Veracruz case. Many of the members of the association of cooperatives were middle class farmers, and their membership included university professors, and actors with positions on important NGOS, such as the organic and Fair Trade certifier, CERTIMEX. Cooperative growth is undeniably impeded by financial capacity, and groups in Mexico did not have the long head-start under more favorable conditions of market protection that Costa Rica's largest cooperatives had. The institutional reality that many producers are also organized into non-commercial producer groups, a holdover of the PRI's corporatist system, may impede forming commercially active networks at the producer level.

Finally, coffee rust in this area has been less destructive than in others. It may be because of more committed famers, who are either organic or engaged actively in farm management, or because of the existence of more technified farms. Soon after coffee rust was identified the local AVERCAFE and SAGARPA offices conducted a forum, and were scheduling monthly meetings, and while these efforts may have opened channels of communication, they do not appear to have led to collective action on the project.

8.6.5.2.3 Spatial

I created the boundaries of the region Veracruz High Coop based on information from expert informants, and it follows the general delimitations used by other recent research (e.g., Abarca-Orozco 2015, Hernandez Rodriguez 2013). The area is on the outskirts of an urban area, which once had coffee. Thus, the hinterlands of that city have functionally merged with the more agricultural city which is not the core of this region. In this way, both Veracruz cases are similar. Some regional organizations are still based in this city, as are two important dry mills, but most activity is in a series of coffee towns. In this sense, while the population is still socially committed to coffee growing, the dispersal of actors and organizations creates a situation where there are less opportunities for interaction.

The intermediary structure is adapted to the spread-out nature of this sub-cluster, but it puts farmers farther away from competing firms. There are, however, small groupings of mills and coffee infrastructure in the areas of greatest activity, and many organizations have offices in the major town, or along the highway to the city, and in these areas there are a larger number of agricultural stores than in other cases. Organizations tend to coordinate with producers to purchase inputs and supplies, but in general, there is a concentration of service providers in the town. What this region does not have, compared to the comparison case, is the development of tourism and value added activities, as exists in Veracruz Low Cooperative. This is, however, a function of its location, and potentially a greater commitment to production agriculture, not its spatial configuration.

8.6.6 Mexico Chiapas

Chiapas has a population of nearly 5 million people, and has Mexico's highest poverty rates and lowest educational attainment rates (INEGI 2011). Coffee is a very important rural industry, and the state government has a special section dedicated to coffee, INCAFECH (Chiapas Coffee Institute (previously COMCAFE (Commission)). However, most of the organizations I interviewed were very suspicious about the government's efficacy with the industry. This suspicion of INCAFECH bridged firm types and clusters, while some actors had more positive perceptions of federal government (SAGERPA) programs.

In part, the mistrust is because many social sector cooperatives (Social sector is the name given to small holder producers, and producers linked to common property, during the 1990s market oriented reforms) emerged during periods of upheaval in rural areas. Until the 1980s, many areas were never fully subject to a land reform process, and rural marginalization created a context for a popular uprising in the 1990s which led to communal land reform, and sparked a national movement to preserve agricultural centers through the National Indigenous Congress, largely through coordinated seizures. The number of agrarian community areas (indigenous communal property) in Chiapas grew from just over 2000 in 1991 to just over 2800 in 2007, and the *residents* in these areas doubled to over 500,000 (Núñez Rodríguez et al 2013 citing INEGI).[25]

Parallel to these movements in the 1990s groups organized under CNOC, a union of cooperatives, aided by the Max Havelaar Fair Trade System (Perezgrovas 2002), and later the Fair Trade movement (Jaffee 2007) to export directly as a block (Celis Callejas 2009). Many current organizations had success in the 1990s and 2000s despite the difficulties caused by the coffee crisis, due to this model and the higher prices obtained by organic coffee (Martinez 2007). In Chiapas, Coordinadora de Pequeños Productores de Café (COOPCAFE) is an umbrella organization for CNOC members, which was formed to create common commercial strategies for these groups. CoopCafe still exists as an advocacy body, but the idea of a common export block for Fair Trade Organic coffee never materialized.

The large number of groups representing farmers in Chiapas may be a product of the on-farm wet milling and drying system. Because of the dry season traditionally coinciding with harvests, there was no need to invest in large wet-milling equipment, or same-day transportation networks (which were impractical because of remoteness) coffee

[25] http://www.scielo.org.mx/scielo.php?script=sci_arttext&pid=S0187-57952013000300003

organizations organize and collect semi-processed coffee from many diffuse producers. Space is less of a constraint than in wet-milling systems, where horizontal collection is limited by capital investments.

While this project focuses on value chain actors, the political nature of coffee in Mexico, and especially Chiapas, means that there are other interests groups that have formed to represent farmers in terms of obtaining assistance from social and agricultural government programs. These actors play an unclear role in the value chain from the perspective of supporting producers, but an oversized role in the politics of coffee. Many of them are a hold-over from the PRI affiliated CNC (National Peasant Commission), which represented ejidos during the PRI's long corporatist period.

There is also more attempts governance at the policy level in Chiapas, than in other areas of Mexico, with ICAFECH, SAGARPA, and AMECAFE all producing policy documents at the state, and regional, levels over the last decade. Perceptions of these programs by the people I interviewed were, in general, quite negative. Many actors complained that the sparse funds available were not strategically located, and that they favored well connected actors.

The main recurring federal SAGARPA program, PROCAMPO in particular, focused on providing around $120 dollars annually in price support, and 500 plants to farmers, but most of these payments filtered through a network of organizations. Projects such as the creation of a geographical indication for Chiapas have had very little success, and in general, groups felt that the support given was negligible, and unreliable. This is not to say the government does nothing. Many groups I interviewed had collaborated on projects with SAGARPA, or the Bank of Mexico's agricultural trust (FIRA), such as new nurseries, or milling equipment, so the role of the government could clearly be seen in many projects with producer organizations, but cooperatives I interviewed in both the Mestizo case and the Indigenous case communicated that governance organizations were incapable of providing a sufficient support network for small holders, and firms that did not work with small holders felt they were insufficiently investing in strategic programs to improve productivity and yields.

8.6.6.1 Chiapas Mestizo

8.6.6.1.1 Institutional

In Chiapas Mestizo there is a mix of large farms, which predominated before the 1980s, and *ejidos* which formed through invasions and hacienda bankruptcies in the 1980s and 1990s (Jurjonas et al 2016). The *ejidos* in Chiapas reported that 35% had some form of communal agricultural association to represent the farmers in in the coffee industry, but these were not all engaged in the value chain (INEGI 2007, 2011).

There are larger farms in the cluster that survived through the period of conflict, in this case, in contrast to Chiapas Indigenous. Coffee farms in this area average 3.7 ha (AMECAFE 2011), which is significantly larger than in the counter-case, but is skewed by the presence of large farms. Farmers in cooperatives also have slightly larger holdings than the area's median.

The coffee crisis arrived in this region after a period of rural insecurity and social conflict, which led to significant re-distribution, especially to indigenous farmers who had come to the region as laborers on the old estates. During the 1990s, larger networks of organic cooperatives grew rapidly, and then retracted due to problems with administration, and very low international prices. However, the proximity of organic producers in this region to natural reserves made it a natural fit for the development of Fair Trade and organic coffee, and many organizations based around producers in different communities emerged. Many communities, and various interest groups self-organized, which is still evident in the number of small organizations operating in the region today. They made important gains in finding new markets, and adding value to their coffee through organic and Fair Trade certification. All of this developed during the worst period of prices on international markets, and producers benefited from these strategies. Starbucks began purchasing through a program to develop quality in environmentally low input coffee production, doing so in conjunction with Conservation International, with the idea of marketing organic coffee grown in harmony with a biosphere reserve. Their brand, called, Mexican Organic Shade Grown, is based around coffee from five cooperatives. Eventually Starbucks developed a quality certification program to go alongside environmental work. These early efforts were integral to the development of their internal Café Practices program, and also put coffee from this region on the international map in terms of name recognition. However, because Starbucks' business model requires volume and uniformity, they eventually began to require that the cooperatives coordinate with a single multinational exporter, who also gained Fair Trade certification, and started to compete against them for coffee (Renard 2009, Renard and Perez-Grovas 2007). Eventually, the cooperatives dropped out of this arrangement because of the export cost, and the threat to their solidarity model posed by being captive to a multinational exporter. This experience showed both the commitment and capacity of organizations in this case to engage in adaptation and upgrading, and also the challenges faced by cooperatives in Mexico when selling in the GVC.

The challenge for these groups is that many large international purchasers prefer to work with a single exporter, or designated regional entities for certification. Multinationals in the region operate an extensive purchasing agent (*coyote*) system. However, they also compete directly against the cooperative model by organizing groups of producers under certifications, whether they be Café Practices, organic, or Fair Trade. A private milling operation in the cluster also purchases coffee for Nestle and operates its 4C certification program.

Despite the large network of cooperatives, and over 90% of farmers growing low-input coffee, without chemical fertilizers, most producers are not certified organic or members of a cooperative. In total, I estimate that cooperatives and producer's groups represent less than a third of the region's coffee, similar to, or even less than in Chiapas Indigenous. In part, this is because the large exporters also coordinate with the largest estates, who sell certified coffees. Many of the largest estates are Rainforest Alliance certified, and while they report significant investments and efforts in creating a more sustainable production model, they rely on high yield coffee. In contrast to other countries, such as Costa Rica or Colombia, virtually no small holder producers in Chiapas engage in high-yield conventional coffee farming. Accordingly, all the cooperatives are oriented towards organic coffee.

As in Chiapas Indigenous, these play significant roles linking their member producers to educational opportunities, support from NGOs, and provided a link to information and learning about coffee. They offer higher prices for engaged farmers, who, acting alone, face obstacles to accessing outside resources and knowledge (Thopson Poo and Valle Leon 2012). Where this case differs from Chiapas Indigenous is that these groups are much more active in engaging government programs, and in Chiapas Mestizo more groups have funding from FIRA, FIRCO, and other state sponsored financial institutions, who subsidized technical support staff and other upgrading activities. However, in this case multinational firms also used these programs through groups of certified farmers, especially in the Café Practices and 4C programs. What appeared to differ was the level of organizational engagement expected of producers, with the cooperatives involving producers in governance committees. Thus, the binary in Chiapas Indigenous between cooperatives and intermediaries is more nuanced in this case, although a minority of the coffee sold to multinationals is certified.

Most of the improvements sponsored by the cooperatives have involved better fertilization, more selective harvesting, improved on-farm processing and drying. A consortium of these groups developed a dry mill and lab that they use to prepare and export together, and the largest cooperative has created its own roasted coffee brand for sale in Mexico, and operates a coffee shop in Tuxtla. These organizations have undertaken long term efforts to improve the quality and productivity of their producers' farms, but they have not been able to finance or support large-scale renovations. Their members produce around 10 quintales a hectare, which is significantly higher than the state's average, but still relatively low, and many farmers have old plantations with low fertility. In part, frustrations expressed in interviews with representatives of producers' organizations regarding the role of the state turned on the systemic incapacity to connect small holder farmers to long term investment in their farms.

8.6.6.1.2 Relational

The fractious nature of the formation of groups in this region still has ramifications. The formation of cooperatives in the 1990s was done at the community level, in part as a replication of the older social organization systems under the INMECAFE and more corporatist agricultural policies before 1990s reforms. Many different interest groups participated in this process, ranging from competing state actors to non-profits. In part, the vision of the 1990s was to create a unified export alliance of these organic groups, and at one point many groups were part of the state-wide CNOC group, CoopCafe, as a cooperative administrator recounted:

> CoopCafe in its golden moment was an instant that promoted and managed the organic industry. They developed proposals that benefited everyone. For example, they at one time had funding and development models for creating wet mills. It was all clear and transparent. They were very involved in Fair Trade. They supported organics a lot. Now they have producers who are not organic, its less clear. In its time CoopCafe was an element against politics as usual. In the end it ended up being just another government dominated group. They became experts in paperwork and proposals. It became very political, a political vehicle. So we're not involved anymore and we've sought out more local collaborations here.

Compared to Costa Rica clusters, this region is geographically large, so the presence of many groups servicing disconnected communities may be a function of socio-spatial organization. However, the low volumes produced in each area puts even the best cooperatives in a constant state of precariousness.

When asked why they did not try to form a single cooperative, or experiment with some forms of consolidation, one interviewee of a small group said, "… it's because of our history, our approaches, our processes." He mentioned that keeping the groups together also required friendships, which would be harder to replicate at a larger scale. Furthermore, many larger groupings for export have failed in the past, costing those who contributed coffee dearly. Thus, groups collaborate more cautiously, and more established and successful organizations tend to seek each other out for commercial or export projects.

The thee strongest cooperatives, those who also worked with Starbucks, have formed a 2successful alliance over the last 10 years., uniting on the export and processing side. Using support from NGOs and SAGARPA funding, they built a dry mill to not have to contract with a third party, and they now control the entire export process. These three cooperatives are also key actors for projects with state and private entities in the fields of biodiversity protection, climate change adaptation, agricultural diversification, and woman controlled coffee brand. They are also the three most common collaborators with research institutions.

Other cooperative organizations exist, but they have less capacity, except for two larger umbrella organizations who have producers organized in this area. These two second level cooperative groups are very active at the state level, and the local groups benefit from their technical advice and commercial networks, but their leadership is not active locally in this case, although one assigns an agronomist financed through FIRA programs.

Larger farms also coordinate with each other extensively, especially in terms of negotiating the purchase of agrochemicals. Multinationals at the local level are mostly represented by commercial offices, with the exception of one which has a larger physical and staff presence due to programs with larger institutional purchasers. This case allows for the comparison of large estate systems with smaller producer systems, only 9% of which use fertilization and actively manage farms. For the large estates, long-term crop management, early detection, modern coffee varietals, and the application of fungicides prevented large losses from coffee rust.

Small holder producers in this case were seriously harmed by coffee rusts, which reduced harvests by 50%, and forced the closure of several organizations in the region. For small holders, the coffee rust epidemic made it clear that value chain networks alone, may they be those coordinated by cooperatives or multinationals, are insufficient to foster long-term crop maintenance. In 2012 the three largest cooperatives started a common nursery to propagate high performing plants selected from members' farms. However, these plants were very rust susceptible, and since then all three organizations have set up large scale nurseries with capacities of 200,000, 150,000, and 450,000 plants (http://www.citigroup.com/citi/about/citizenship/download/2014/country/mexico_2014_english.pdf. Other organizations have started smaller nursery programs, including the three large multinationals which all have nurseries in Chiapas, with the largest in this area representing a capacity of 3,000,000 plants a year. All of the nurseries that receive state funding must be willing to sell to the public, although they are designed to support the cooperative members, or in the case of multinationals, the organized producers' groups they sponsor, to be given on favorable credit terms in exchange for future coffee deliveries. Those close to the programs estimate that 90,000,000 plants would be needed to cover the renovation of outdated coffee farms in this region, and 300,000,000 in the state of Chiapas (Mendoza Mendoza 2016, https://www.youtube.com/watch?v=xhu77FhRoBU).

The approaches of the cooperatives and multinationals to the rust epidemic show their different knowledge networks. Organic organizations have chosen to focus on developing their own seedlings, while multinationals have used seeds designed for conventional coffee, produced through research programs, and implemented with technical packages for fertilization and fungicides. Representatives of organic producers fear that this process will undermine organic production, and lead to more farmers relying on pesticides, and proprietary agricultural products, while the multinationals hope that they finally offer an opportunity for higher yield farming in accordance with standards of programs, such as 4C and Café Practices.

There is no short-term solution to the region's chronic underinvestment at the farm level. However, greater state involvement has spurred a wave of investment. It has shown that small scale producers in Mexico need wage support, technical support, plant support, and fertilizer support to have resilient farms. The question is how long government support for these activities will be sustained, and to what extent farmers who are not organized under a cooperative or certification program will benefit.

8.6.6.1.3 Spatial

This case is sub-area of a larger political area, but it covers three municipalities where most coffee is grown and which form a coherent area of production, with little connection to the other areas, although they are in the same mountain range. Here, most of the coffee is produced high in the sierra, near a large biosphere reserve. The area was settled by the government in the 20th century, and there are a mix of large estates, some with connections to German immigrants before WWI, and *ejidos*. Before the unrest of the 1980s, there were many large estates, and a handful of these still exist. Many producer areas are quite remote, and the town, as in the case of Chiapas Indigenous, is where the organizations are based, except for the larger farms, which mill on-site. These firms internalize operations, and ship to the main city, then export. However, the coffee cooperatives, and purchasing firms, cluster their offices and warehouses in the town, except for two which are in another subsector. In this town, the three multinationals have facilities, and staff, and there are 8 producers' cooperatives representing different areas, and groups. The position of the town is at a spatial brokerage point between the coffee producing areas in the mountains and a long valley that also includes the state capitol, some two hours away.

8.6.6.2 Chiapas Indigenous

8.6.6.2.1 Institutional

The institutional configuration of this case is complex, and goes beyond the coffee industry. There are variations, for example, in local government among municipally controlled areas, and areas declared as "autonomous" communities by Zapatista communities. Organizations formed by these communities do not participate in government programs (they don't pay taxes and don't receive government aid). Thus, in the area there are organizations ranging from CNC affiliated groups to those whose memberships are affiliated with the EZLN (Zapatista National Liberation Army) (Tarrío García and Conchiero Bórquez 2006, Reyes Ramos 2007). Most land in coffee production is managed under communal indigenous autonomous communities, although some areas have private title, and there are non-indigenous and indigenous *ejidos* in the region. Some smaller areas are managed as MAREZ (Zapatista autonomous areas) and do not recognize the authority of the Mexican state.

SAGARPA estimates that over 82% of coffee grown in this region is sold by individual farmers to purchasing agents, who then sell to multinational exporters, two of which are the most prevalent in this area, while 3% of farmers sell in organized units to purchasing agents, and 15% is organized through producers' associations (SAGARPA 2014).[26] Thus, there is an important transactional level that sits between the producer and the purchasers of coffee. In part this is a function of more than 90% of registered farmers in this region farming less than .5 HA, with informants describing average yields of around 6-10 quintales (or 600-1000 pounds) per hectare of green coffee. Furthermore, 98% of producers in this case use traditional growing methods, without chemical fertilizers AMECAFE (2011), but only the 18% of farmers selling through organized programs are able to benefit from certified organic price premiums.

The purchasing agents (*coyotes*) are, in large part, the response to problems of economies of scale, and transaction costs. Also, as Cronon observed in his study of 19th Century Grain merchants, commodities traders can arbitrage by paying a lower price for coffee of uneven quality, and then sort to produce more valuable higher-grade blends (Cronon 1991).

[26] I used a reduced number of municipalities in my analysis, but these numbers are representative of the descriptions given to me by key informants, including SAGARPA itself. There is also the challenge of reporting, where parts of the territory have chosen not to participate with government programs. I was unable to fully clarify how coffee from these areas figured in official statistics.

Producers' associations do not have this luxury, and often work with the most committed farmers, who tend to have slightly larger holdings. What they offer is both a vision of a community based agricultural marketing model, and certifications, organic and Fair Trade. However, because they are long-term projects, competing against multinational backed purchasing agents who pay up-front, they frequently struggle to collect sufficient volumes to fulfill contracts, leading to unstable commercial relationships with some Fair Trade buyers, despite a very strong international reputation, and thousands of members. To put this in context, the core Costa Rican cooperatives, export in the millions of pounds. Other organizations are smaller, and several operate with second-level cooperatives based out of larger cities in the state. Thus, even within the social sector, there is a complex overlapping of organizations. These organizations have done impressive work to give indigenous farmers a voice in global markets, and to create deserved interest in their product, but they face an uphill battle without resources to underwrite large-scale on-farm investments.

Recognizing their commercial precariousness should not distract from the fact that these producers' groups have been important in developing an institutional structure that gives a voice and identity to their members, which is lost in the intermediary system. The area's main city is a tourist hub, and two cooperatives operate coffee shops, and sell roasted coffee as a value-added product. A group of producers' organizations jointly operates a Coffee Museum, while many are involved with international NGOs located in the city, three of which directly engage the coffee industry, either in terms of business administration and alternative finance, or environmental issues. This is apart from certifiers, who offer an additional opportunity for development. Because the intermediary system in this region, is primarily transactional, without the development of a network of local cooperatives, there is little institutional structure to support coffee farmers.

8.6.6.2.2 Relational

In Chiapas Indigenous, producers' organizations have catalyzed nearly all development and extensionism work in the cluster. They have taken advantage of several universities, and centers in the region who have significant coffee research agendas. These relationships have been important, if intermittent, in sharing knowledge about organic farming, and framing the challenges for farmers, as well as providing representation through national bodies, namely CNOC.

> **International Tourism and Specialty Coffee in Chiapas**: This cluster is based around a colonial era city, home to a large international tourism segment (Lyon 2007). Cooperatives have opened their own cafes and started to sell roasted coffee. These are both revenue and marketing strategy and show the savviness of the region's cooperatives to engage internationally. Several small specialty roasters have also appeared who are slowly cultivating relationships with regional producers. These roasters represent both a link to the network of specialty coffee, and to local food networks. These roasters sell at very high prices for the Mexican market, but can take advantage of evolving tastes, a large ex-pat community, and tourists. One roaster has grown rapidly, and is developing a microlot system for artisanal coffee at his high-end coffee shops; his enterprise is a strong fit for this region, but the transaction costs for this market segment are high, and require that both the purchaser and producer have sufficient trust and resources to invest in upgrading. The quality requirements for this market require that, as in Costa Rica, producers must be very selective about harvesting, spend more on plant care, and use improved milling and processing techniques. These strategies may not be scalable, and no producers from the region are currently exporting from micro lots, apart from very tentative projects in some cooperatives, but this may change in the future after the coffee rust crisis is over.

Moreover, international solidarity networks, sympathetic to indigenous political movements, have operated primarily through the groups, and several roasters in the United States sell coffee through direct trade relationships with Zapatista organizations. In this sense, the coffee value chain has provided a greater diversity of opportunities than have internal development institutions in Mexico. Government agencies, principally SAGARPA, are also present, but they have limited staff, and mostly focus on monitoring and distributing funds. The Mexican state does not have the capacity to provide direct technical attention to the number of farmers engaged in coffee growing in this region. At the very end of the study period the local office of SAGARPA presented a development plan (Burgos-Barreto et al 2014), but its future is unclear. Furthermore, at least two municipalities have opened coffee offices, but they appear to engage in program administration, and I could find no evidence of a technical or development agenda.

Private non-indigenous firms have struggled to work in this region, except through multinational backed purchasing agents. There are no non-cooperative national or estate mills in the region, in part because the coffee industry was built from the ground up by indigenous producers. For indigenous producers, relationships with value chain actors face many obstacles. The first is that many produce very little coffee, which has facilitated an intermediary system, where the producer is even farther from the mill, or purchasing organization. Farmers may not even know what company is buying their coffee. These relationships are also strained by the historic marginalization of indigenous people in the coffee industry. Indigenous farmers started as farm labor, often as migrants to haciendas. Coffee came to this area from such farmers who brought seedlings back from other areas of Chiapas. In part, this history of marginalization with mainstream Mexican economic actors and the state led to the Zapatista uprising, during which time one group's founders were victims of a violent attack, allegedly by a paramilitary group loyal to the state, and while most producers in the region are not Zapatistas, they value the autonomy and identity of their communities.

There are then language and cultural barriers. The worldview of industry actors was born out of the estate model, and this model values high yields, and market driven strategies. Many of the producers' organizations in the region have an ideological worldview that is born out of being excluded, and oftentimes, exploited by that model. As a result, many producers' groups in this region mistrust multinationals, who, they argue, take advantage of their weak position. Traditional exporting firms in Mexico also did very little to bridge the cultural divide, and recognize the context of indigenous communities. They had few, if any, indigenous staff, or in community presence and instead relied on purchasing agents and arm's length transactions.

All three big multinationals operate warehouses in the region's main city. One has an intermittent logistics and purchasing presence during harvest, another operates the facility but buys virtually no coffee from this area, and the third has a presence and is a major purchaser but via purchasing agents. In interviews their representatives expressed that there was often mutual mistrust, which led to purely transactional interactions via price and credit with farmers. Mone of the large multinationals had invested in certification or technical support programs in this case. Such mistrust is not universal, and some producers' groups sell coffee to these export groups, often out of necessity, but frequently because of competitive prices, and several have working relationships.

For other cooperative organizations, coffee, as much as it is a commodity product, was also an important symbol of autonomy and affirmation, because it was one of the first industries where indigenous people could interact directly with the global economy (Martinez 2007). Fair Trade and organic coffee offered these farmers the opportunity for market recognition of their livelihoods; and relationships with socially oriented roasters in the United States and in Europe are important for their long-term projects.

These groups are not monolithic, and they struggle due to divisions based on dialect, community, and political affiliation. Organization of producers into cooperatives or producers' associations faces the challenge that many in the region have very strong local community and family identities. However, there are also ideological barriers to cooperation, especially regarding attitudes towards the Mexican state, combined with the problem of coordination where coffee is produced in very small amounts, by large numbers of people.

In terms of supporting producers, during the study period the cooperatives were the only clear presence in the case that comes directly from the coffee value chain. They have sponsored training, field visits, inspections, and most require their members to be active in these processes as a means of internal quality and productivity improvement. They have also ventured into diversification projects, such as honey, and in general functioned as mediators, or brokers, for isolated communities. They have existed within a larger network of solidarity NGOs, of which coffee is only one small facet of a much larger post-Zapatista alternative development network. As such, the network effect of cooperatives in this case far exceeds their market positions. Despite representing only a small portion of the region's total volume, they are the clear catalysts of upgrading, policy, and farmer support activities.

Seen from the perspective that coffee only coalesced as a serious economic activity in this region in the 1980s and 1990s, adaptations and growth were relatively successful throughout the 2000s and during my case study period. However, progress by Fair Trade and organic producers'associations could only do so much in the absence of a larger development and value chain support network organized around this territory. Organic coffee provided a platform for adaptation, and an outlet for indigenous farmers to enter markets that valued their communities on their own terms, but solidarity networks did not resolve the underlying vulnerability of the producers.

Many farmers, even those organized in cooperatives, lacked the resources to invest in renovating their plant stock, and most do not engage in pruning or fertilization. Neither government programs, nor cooperative networks, could sufficiently address this issue at a regional scale, and powerful economic institutions from exporters to state-run development banks, such as FIRA, had virtually no on-the-ground presence. With that said, both state organizations, and multinationals recognized in interviews the need to improve services in this cluster. The multinationals were hiring staff from the region, and fluent in Maya dialects, and starting to organize groups for certification. It is not clear, however, to what extent this will change the purchasing agent system, and whether they will be able to create more a more embedded and collaborative presence in this cluster.

All of this has led to a coffee growing region with poor farmers, and no structural support from powerful actors for investment or farm improvements, either for organic or conventional growing methods. Moreover, entry into Fair Trade and organic production may have shifted attention from the longer-term reality that investment in maintenance and productivity are essential for agricultural industries. This is a challenge in this region because local knowledge networks are built around complex multicrop agricultural traditions that intertwine with deeply embedded local cultures. Bridging this local culture with industry networks based around monocrop epistemologies has proved difficult. Growing interest in agroecology has grown in academic and NGO circles, but has not led to financial or production models capable of supporting large scale investments in this region.

These long-term deficits came to a head with the coffee rust epidemic, and Chiapas Indigenous has been one of the most severely affected areas, with production plummeting after 2013 as much as 70%. There is no clear answer for these farmers from the coffee value chain, as larger actors support engineered plans based around agrochemicals. Organic producers have looked to international forums and local support networks, including educational institutions, but there are no clear answers for them without very large re-investment programs that only the state could undertake, and early efforts to address coffee rust through rust-resistant varietals provided plants to less than 500 producers state-wide. Some groups indicated that they were starting their own nurseries, but doing so with hand selected plants, not government programs, because they did not trust the quality of those distributed in government programs.

A combination of increasing social conscience, and recent problems with volume in the supply chain from the region, have led these larger companies to reach out to certain areas to form producers' clusters, which they will support in certifications, mainly organic and Fair Trade. They are also considering ways to incorporate staff who speak the local dialects. One multinational reported 8 producers' groups, and was recruiting Mayan-language fluent staff to create more. However, the long-term weakness in the overall governance network for coffee in this region left it isolated and vulnerable in times of crisis, despite the work of producers' organizations to develop new Fair Trade and organic production models.

8.6.6.2.3 Spatial

The territory in this case is spread-out and mountainous with a poor road network compared, especially, to the Costa Rica cases. Many of the offices and warehouses of the coffee mills are in the city due to access, utilities, and other business support. There are some smaller organizations which operate at the local level, but these tend to depend on second-level cooperatives, based in Tuxtla.

There is little coffee related infrastructure, or support, available in the towns and villages of the study area. Much of this has to do with the low-input farming methods where farmers purchase neither fertilizers or pesticides. Coffee is an integral practice of the mixed crop landscape of many households, which means it is important culturally, and despite problems with the industry, many farmers maintain a connection to the industry, without potentially, enough production to take advantage of economies of scale at the local level. Because farmers are so removed from the value chain, there is little spillover from improvements made by some farmers engaged with active organizations. The intermediary system effectively cuts off knowledge flows by making all transactions price driven.

Some farmers, however, receive the benefit of proximity to a city in terms of opportunities for value added activities. This is one of the few cases where the city's growth is not threatening agricultural lands, in part because of geography, and in part because of indigenous cultural and land use systems, although farm-to-city migration is a constant reality. Spillovers from proximity to the city are easily observed. Producer organizations have opened coffee shops, and have access to financial institutions, NGOs, and government agencies. What has evolved is a system of representatives and administrators from the organizations who manage these relationships. They coordinate with the groups' leadership, and help negotiate export, and support from the government. However, this produces a principal agent problem, where the representatives of the organizations are spatially, as well as culturally and linguistically, separated from the membership, and engaged in significantly different activities. Although the representatives operate in good faith, the nature of these roles, and their spatial separation, creates an urban/rural split in the network of relationships and knowledge in some cooperatives.

8.6.6.3 Comparison of MX Cases

With regards to H1 ("Clusters with strong cooperatives will be relatively more resilient"), the outcomes presented in Chapter 6 suggest that of the Veracruz cases, the High Cooperative area was more resilient on almost every measure. In terms of my qualitative data in the Veracruz cases, what stands out about High Cooperative case versus Low Cooperative is the presence of a series of cooperatives that have articulated an alternative strategy for small producers. Likewise, in both of my Chiapas cases, the rebound from the coffee crisis was resilient in terms of the data presented in Chapter 6, and the role of cooperatives in both of these clusters was central to finding solutions for small holder producers.

This also helps to confirm H2 ("Cluster resilience will correspond to areas whose institutions encourage value chain upgrading"), because the cooperative movement in

Mexico was a response to the coyote system, and to low prices, which led producers to seek out value added markets with organic and Fair Trade coffees. There has been some support for the government for these programs, but upgrading also happened most intensively in areas where there were larger farms (like Chiapas Mestizo and Veracruz), and GVC actors, such as Nestle, wanted to make strategic investments. This suggests an interaction between institutional context and the potential of the cluster. However, there appears to be a problem at the national level in Mexico in terms of mechanisms to encourage farmer support and investment. Part of this, I suggest, is that the organizations with greatest capacity and knowledge are relationally distant from producers because of the use of purchasing agents (*coyotes*) that distances the farmer from the value chain.

In all of the cases most of the small holder producers sold through purchasing agents, and lacked support from GVC actors to upgrade, or make investments to improve yields, and protect their crops from disease. In this context, there is a proposal to revive INMECAFE (Escamilla 2015).

There was clear evidence of greater levels of collaboration and knowledge sharing in the High Cooperative Veracruz case, which supports the relational hypotheses H5 ("Cluster resilience will correspond to stronger social networks and social capital within the cluster (akin to bonding capital)"), but in Chiapas the networks were of similar density at the cluster level, although there were many more examples of collaboration in the Chiapas Mestizo case. This may be because of the maturity of the cluster, or just its size, but it may also reflect the larger range of institutional actors.

H6 (“More resilient clusters will have more open knowledge and collaboration networks (akin to bridging capital).”). Regarding this hypothesis, the Mexico cases suggest that what is important is a combination of locally embedded mills, a links to the GVC. Both the Chiapas Mestizo case and the Veracruz High Cooperative cases were the most engaged with research, and with knowledge related activities, were also the areas powerful buyers showed the most interest. Actors in this case have been much more active than in Chiapas Indigenous in obtaining funding to fight rust. In part because more coffee in this case is certified, and there is more direct presence of the multinational mills here, there are more programs to support farmers than in Chiapas Indigenous.

Bridging capital is an imperfect descriptor when comparing the Chiapas cases, because indigenous cooperatives have actively sought out global partners based around high trust relationships. However, there is greater friction, especially with the state. The rust response demonstrates how, there is less friction with Mexican government programs in Chiapas Mestizo. Moreover, the Chiapas Mestizo town is dominated by coffee, which allows for strong business ties among these groups, and also a single platform for coffee from the region. There are also representatives of certifiers nearby and other support organizations, as well as government coffee offices. However, as in the other Chiapas case, the producers themselves live in very isolated areas, with strong community level networks.

The overall low yield levels in the Chiapas cases support spatial hypotheses H7 (“Resilient areas will have better access to labor pools and transportation networks.”), and H8 (“Resilient areas will benefit from the industrialization economies provided by greater concentration of industry infrastructure and intermediary organizations.”), because in both cases farmers are far away from the towns and market. However, both cases were relatively resilient during the study period (pre-coffee rust), which may have been a function of their rural populations and the expansion of road networks into the clusters. In Veracruz Low Cooperative, the loss of mills and support infrastructure seems created a bigger cycle of disinvestment at the farm level, signaled by the data in Chapter 6, and punctuated by the coffee rust epidemic.

CHAPTER 9. REGRESSION BASED ANALYSIS: AGGLOMERATION AND COOPERATIVE INSTITUTIONAL ORIENTATION AND LAND USE CHANGE IN COSTA RICA COFFEE

9.1 Introduction

This chapter applies two elements of the adaptive efficiency model to land use change over a 10-year period that started with the worst part of the "coffee crisis," caused by historically low prices, and ended in 2012-2013 at the end of a long global price recovery and the emergence of specialty coffee markets as important drivers of the industry in Central and North America. I use land use change to represent resilience in coffee, because of its environmental implications in agroforestry landscapes, and because it implies persistence, and the ability to adapt to market and environmental stresses. In terms of the model, in this section I focus on spatial factors related to industry and locational agglomeration and the institutional factors of cooperative governance at the local level.

In purely economic models, individuals make choices about land use based on expected future rent for a particular land use, given the intrinsic characteristics of a parcel of land (Ricardian) or market access and locational attributes (Bosselman 2012, Garrett et al. 2013, Gruber and Soci 2010). However, the decision to produce, or stop producing coffee, is a mixture of economic, political, and social factors. A wealth of literature exists about the causes of land use change in the tropics (see, e.g., Veldcamp et al. 2001). In coffee land use systems these include biophysical factors (soil, rain, altitude) (Rueda and

Lambin 2013a), intensification of production (Guhl 2004, Lambin et al. 2000), population density and socioeconomic changes (Guhl 2004, Lambin & Meiyfroidt 2010, Rueda and Lambin 2013a, Blackman et al. 2008, Blackman et al. 2012), urbanization (Benitez 2012), location or accessibility (Southworth et al. 2004, Guhl 2004 & 2008, Blackman et al. 2012), access to institutions (Southworth & Tucker 2001), rural infrastructure (Von Braun 1995, Guhl 2004), global forces (Lambin and Meyfroidt 2011 A), and regional reputation (or *terroir*) (Rueda and Lambin 2013a).

Social factors may influence agricultural coffee land use preservation negatively (e.g., migration and transition to a service economy) (Bosselmann 2012) or positively (e.g., cultural traditions surrounding small-scale agriculture) (Guhl 2004). Garrett et al. (2013, 233) argue that there is also a need to "...understand local land use as a function of the concentration and diversity of various supply chain actors in the region." On that note, Rueda and Lambin (2013, 290) identify "…other factors [that] create incentives and constraints for farmers' land-use decisions. These include labor availability […] non-farm income opportunities […], land endowments […], institutional factors such as local support for engaging in these market segments…" This approach to understanding how the global coffee market connects to shifts in local production locations has directly inspired aspects of this project. Specifically, I frame this chapter under the idea that changes in the global value chain for coffee (i.e., the emergence of specialty markets and strong geographic preferences from buyers) and climate change have created a new interest in understanding the relationships between global processes and local clusters. In some socioecological literature, these non-local and sometimes hard to observe links are called *teleconnections*. (Eakin et al 2009).

Here I test whether elements of our model, spatial and institutional factors, affected the resilience of coffee land use within the global value chain during a ten-year period. Specifically, I contribute to the literature on land use decisions in the coffee industry by applying elements of the adaptive efficiency model to the resilience of land use in Costa Rican coffee between 2001 and 2012. This period is known as the 'coffee crisis" (Bacon 2005), during which prices troughed in 2001-2003, and then gradually rebounded during a global commodities boom until 2012, when there was a strong market correction, followed by a serious crop disease problem (coffee rust (roya)) in Central America. The coffee crisis started I the mid-1990s after the price system of the International Coffee Agreement (ICA) dissolved in 1989, leading to a first crisis cycle, but I study the second crisis cycle from 2001-2012. This period represents an important inflection point in Costa Rican and global, coffee production, during which time Arabica producing countries in Latin America came under extreme pressures due to a global glut of coffee from new producer nations.

The study period for this section is bookended by the market peak and trough on either side of the coffee crisis of the 2000s. It represents an important period from the standpoint of regional resilience because many elements of the coffee market fundamentally transformed starting at the beginning of this period with the emergence of the specialty market (Ponte 2002), which changed coffee from a commodity product principally traded on volume to one where differentiation and exclusive niches became more and more important, as did the concept of *terroir* (Rueda and Lambin 2013a).

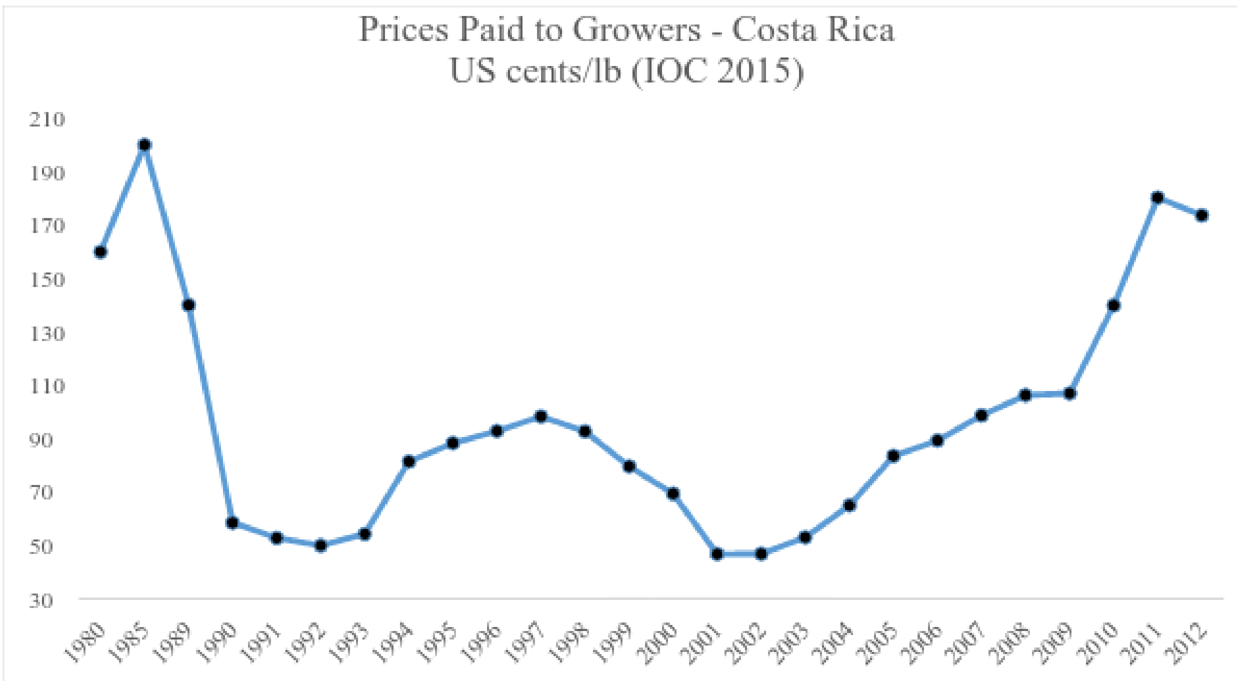

Figure 9-1 International Prices from Coffee 1980-2012. The period between 1990 and 2005 is called the coffee crisis. 1990-2000 is the post-ICA cycle in the crisis, and 2001-2012 is the study period for this study.

In response to the crisis, upgrading to the specialty segment became the central focus of the Costa Rican coffee industry (Samper 2002),[27] to the detriment of marginal

[27] Costa Rica is a high cost producer country, with highly technified coffee, and high growing costs due to a fairly strong social safety net and high human development for the

production areas (Pelupussy & Diaz-Porras 2008), but this was somewhat complicated by the fact that many of the areas with the highest potential for coffee production faced urbanism pressures (Pujol et al 2010). Distinct aspects of Costa Rica's coffee industry include its strong cooperative sector, environmental regulations for mills, and ICAFE which administers a price distribution law guarantying minimum percentages of export prices to farmers. Within this national industry environment, during the study period the Costa Rican coffee market went from one with high yields and volume orientation to one ever more focused on value added coffee activities (Samper 2010), such as environmental certifications (Cite 2016), the development of purchaser driven upgrading programs (e.g., Nespresso AAA), and, depending on the region, agroecological adaptations (incorporating mixed crops and lower chemical inputs (Balbin 2015)) or the development of micromills (Mena 2014). Costa Rica obtains a price premium on trading markets because of its reputation for high quality coffee, and has developed several renowned growing regions, which obtain particularly high premiums.

Despite these adaptations, Costa Rica has lost land use dedicated to coffee production and is producing significantly less coffee than in the 1990s. Beyond the crisis in price, exit from the coffee industry is due to demographic and educational changes (Bosselman 2013a) which make coffee less important to the Costa Rican economy than it was previously (Samper 2010), when it played a central role in the development of the country (Williams 1994). As a result, in the period under study Costa Rica lost almost 20% of its land dedicated to coffee production, threatening cultural landscapes cultivated in the

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region (Samper 2010). Accordingly, upgrading and focusing on increasing value added through the specialty market has been a principal adaptation strategy.

20th century, and potentially leading to conversion to less environmentally sensitive uses, such as pastures for cattle, row crops, or urban development.

Accordingly, for this study, I focus on causes of land use change that are under the control of individuals or public policies. I measure land use change using data produced by ICAFE in 2001 and 2012, which bookend my period of interest.[28] This subject has been approached at the regional level but not at the country wide level in Costa Rica. Moreover, by looking at land use change in Costa Rica it is possible to analyze how institutional variation and spatial elements of the adaptive efficiency model help predict this land use trajectory. I do so through the lens of Global Value Chains. Retaining coffee land use in Costa Rica in my study period means that local coffee clusters have made institutional adaptations and enjoyed market advantages that have preserved competitiveness during a period of stress (See Chapter 7). This adaptive process is at the crux of regional industry resilience. The adaptive efficiency model posits that a mix of institutional factors, relational factors, and spatial agglomeration factors, along with fundamental labor and land endowments, have an important effect on the ability of a local industry to adapt. In the present paper I posit that these factors are important in agriculture, and I test the role of two factors in the model, notably the spatial concentration of the industry and its institutional composition at the local level. I do so to address the larger dissertations posed by **Hypothesis 8**: Resilient areas will have better access to labor pools and transportation

[28] There is a third land use layer, but it was produced over a period of years for different regions, and due to the small sample size I did not include it.

networks and & **Hypothesis 9**: Resilient areas will benefit from the industrialization economies provided by greater concentration of industry infrastructure and intermediary organizations.

While urbanization economies do not exist in agriculture, I posit that localization and industrialization economies from the concentration of infrastructure, knowledge, and relationships in coffee-producing sub-clusters are important. I think that forms of institutional firm structures influence the embeddedness of firms in the social fabric of the sub-cluster, and that greater embeddedness will contribute to greater local stickiness, and thus resilience. I argue that the institutional benefits provided by cooperative milling organizations together with the emergence of micromills, contribute to resilience in Costa Rican coffee.

In asking this question I specifically test Hypothesis 1: Clusters with strong cooperatives will be relatively more resilient.

I create a parsimonious model of the institutional orientation of the local industry by measuring the relative percentage of coffee sold to cooperatively-owned mills as compared with other types of mills, together with variables regarding spatial agglomeration (clustering). This research complements regional level studies in Costa Rica, including Bosselman 2013a, who looked at household factors, and Balbin 2015, who looked at household and agroecological factors at the parcel level in a single region, as well as the work of Rueda and Lambin 2013a, who explored the effect of global changes in the coffee market on the location of coffee in Colombia.

9.2 Methods

In this section I explain the rational for my model, which in broad terms attempts to explain land use change in Costa Rican coffee at the sub-municipal (district) level, controlling for natural and social variables, and presenting explanatory variables measuring industry agglomeration and the institutional mix of firms at the district level as measures of the adaptive efficiency model Table 9-1 Variables in Model().

Table 9-1 Variables in Model

Model Components	Variables
Response	Percent change land in coffee production
Controls	Rain-Elevation index
	Percent urban population 2000
	Percent urban population 2011
	Distance to GAM
Explanatory: Agglomeration	Rural population in 2000
	Rural population in 2011
	Distance to collectors
	Mills purchasing coffee in 2001
Explanatory: Institutional	Co-ops 1999-2002
	Coops 1999-2013

The data set for the model rests upon Costa Rica census (INEC) data, and other widely used data sets that have been used in other academic studies (e.g., Andam and Ferraro 2008) and data provided by ICAFE (see Table 9.2, Descriptive Statistics of Model Components). In this model, I regress land use change against: a) control variables regarding environmental endowments and urbanization, and b) explanatory variables corresponding to institutional and agglomeration indicators.

9.2.1 Response Variable -- Percent Change in Land Use for Coffee Production

The response variable in this study is the percent change in coffee in substantial coffee producing districts in Costa Rica between 2001 and 2012 (see Romero and Guzman 2014). The conservation of land use is a good indicator for resilience, because its fragmentation can start a downward spiral for agricultural industries (Brabec and Smith 2002, Southwarth et al 2004). Costa Rica's ICAFE has sponsored exhaustive land use censuses of the coffee industry which provide parcel-level data on the location of coffee activity in 2001 and 2012.[29] The land-use data is built upon parcel-level data collected in two surveys in 2001-2002 and 2011-2012. These surveys included ground-truthing polygons that were created using remote-sensing techniques. I use this data to create a land-use change analysis at the sub-municipal or *district level*.

I use districts, which are components of *cantons* (municipalities). Other similar research on coffee has focused on municipal level changes (Rueda and Lambin 2013a), but this is a coarse measure for a small country, and research on land use change in Costa Rica has used municipal or district level controls (Adam and Ferraro 2008). I focus on districts because municipal level measures, especially spatially sensitive environmental variables, such as elevation, rainfall, and temperature, and variables influencing transportation costs, such as distance to roads and coffee receivers, may vary within municipalities, especially larger ones. Other research has focused on parcels (Blackman et al 2008) using environmental and remotely sensed layers, but my interest in the larger coffee industry makes districts appropriate. Moreover, districts have been used in previous research on land use change

[29] There was also a rolling census between 2004 and 2006, but I do not use it because it does not include parallel measures in time among regions.

and conservation in Costa Rica (Andam and Ferraro 2008). To focus on core coffee growing areas, and to make comparisons among regions, this study eliminated all areas that had less than 100 Ha of coffee in 2001, which left us with an n of 161.mBecause coffee has expanded into very few new districts, but atrophied in many, eliminating districts with only small amounts of coffee reduced the possibility for large swings in a district based on changes in a few small farms.[30]

Before using the variable I regressed it against the total amount of coffee in each district in 2001 to ensure that it was not correlated, and checked that the distribution was not biased (

Figure 9-2 Coffee in 2001 v. Percent Change in Coffee Land Use 2001-2012).

[30] One additional district was found to be an outlier and was eliminated from the analysis, because it had a 200% increase in coffee.

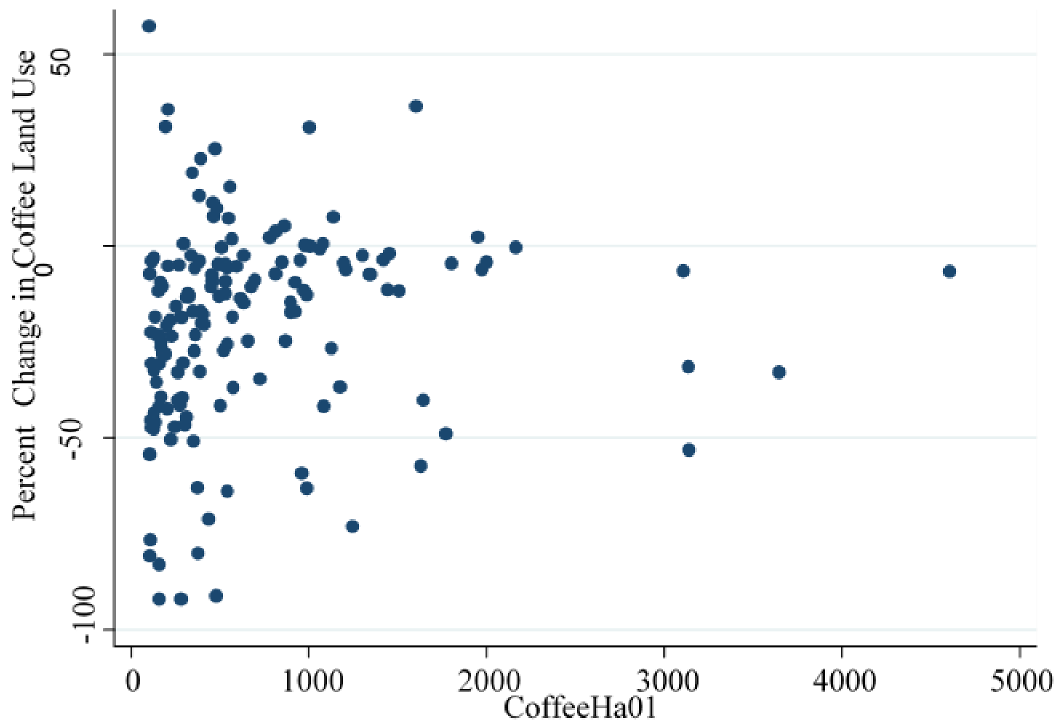


Figure 9-2 Coffee in 2001 v. Percent Change in Coffee Land Use 2001-2012

9.2.2 Controls

9.2.2.1 <u>Rain and Elevation Index</u>

There has been a strong trend towards the concentration of coffee in Arabica-producing areas of Latin America towards higher elevation regions with specific terroir reputations (Rueda and Lambin 2013a). This has come at the detriment of areas that are marginal because of elevation, soils, and/or rainfall patterns which make ripening sporadic and thus harvesting fully ripe beans more expensive. Within a small country such as Costa Rica, rainfall patterns and elevation are the principal drivers of variation among coffee growing regions in terms of the physical geography affecting the capacity for the area to produce hard bean coffees with flavor profiles that attract the specialty market. All things being equal it is expected that coffee growing areas with higher elevations and with favorable rainfall patterns would have showed less vulnerability during the coffee crisis. Because of the limited N in this study, I created an unweighted index of rainfall and temperature to control for these factors. The rainfall and temperature data were taken from the Costa Rica Atlas and merged into a single index using the average temperature assigned to coffee polygons in the 2001 land use layer. Thus the measure is the unweighted combination of the average elevation and inverse of rainfall for coffee in 2001 ICAFE layer on 0-1 scales. We use inverse temperatures because areas with defined rainy seasons tend to promote uniform ripening and higher cup quality, and elevation is commonly used as a requirement for specialty level coffees (Wintgens 2004).

9.2.2.2 Percent Urban Population

The underlying social causes of transition away from agriculture are both complex and well documented. They involve household demographics, non-farm labor opportunities, and education attainment, among others. These factors help predict why households with older, less educated members, and larger families, have tended to remain in the coffee industry in Costa Rica as the economy modernizes (Bosselman (2013). To incorporate some of these forces while preserving parsimony I use a measure of the percent of the population in each district classified as urban (%Urban) in the 2001 and 2011 Costa Rica Census (INEC) because urbanization is the manifestation of these changes away from agriculture on a social and landscape level. These measures broadly encompass many of Costa Rica’s social changes as it transitions to a more urbanized, less agricultural society. Describing this phenomenon, however, is not the purpose of this section which is focused on institutional and agglomeration factors, and treats other social questions as exogenous.

9.2.2.3 Distance to GAM

I ran the near tool for distance (geodesic distance) from the San Jose urbanized area in 2005 (INEC 2013) for each district's border, calculated in Kilometers. This reflects the distance to the urbanized area of the GAM for the district, which Pujol et al (2010) identified as a significant threat to coffee land use, because of the differential between urban and agricultural land values and non-agricultural employment opportunities.

9.2.3 Explanatory Variables for Agglomeration

9.2.3.1 Labor Supply: Rural Population

To measure the agglomeration of potential labor for agriculture I use a measure of the total rural population in each district in 2001 and 2011 (INEC). The total rural population broadly represents the availability of labor for farm formation and maintenance, although in Costa Rica this is significantly multiplied by seasonal migrant labor, which I am unable to measure.

9.2.3.2 Mill Based Agglomeration Measures

I argue that local coffee processors, *the beneficios*, are the central actors in coffee clusters, and thus, my principal measures for industry agglomeration, in the spatial factors element of the model, focus on these actors and their infrastructure.

9.2.3.3 Average Distance to Receiving Point

Most coffee in Costa Rica is sold to wet-mills. This was overwhelmingly the case at the beginning of my study period, and continues to be true even as many specialty producers have opened their own micromills. The way purchasing wet-mills generally operate is by locating receiving points manned during the harvest season. This is a way for mills to reduce transportation costs for farmers and assure that coffee is delivered promptly after it is picked to guarantee fast milling and avoid damage by fermentation. Some farmers may deliver coffee directly to mills if they are close enough, and larger producers can in some circumstances arrange for transportation, but the majority of coffee is delivered by small producers (less than 10ha) to local receiving points.E

In 2001, ICAFE created a GIS shape file with the receiving points of major mills. I use this shape file to measure the average distance of the 4ha grid cells that contained coffee in each district, reflecting average farm size, as a means of measuring the relative market access of farms in a district.

9.2.3.4 Number of Mills in a District

I used a similar approach with the number of mills, counting the number of mills registering sales in a district in 2002 and 2012. I chose not to aggregate this measure because mill infrastructure is more stable than coffee prices, and I wanted a snapshot of conditions at the beginning and end of the period. I thus counted the number of mills in 2002 as an indicator of the effect of competition for coffee or the agglomeration of industry actors on the long-term change. For 2012 the variable risks being an outcome, but I think it also indicates institutional adaptation in terms of the reconfiguration of local value chain actors with new institutional ties aimed at the specialty market, and the micromill revolution (Mena 2014).

9.2.4 Explanatory Variable: Institutional

9.2.4.1 Percentage of Coffee in a District Purchased by Cooperatives

Costa Rica's Law 2762 regulating the coffee industry requires that every sale of coffee at receivers or mills be registered with ICAFE. Using ICAFE data on total sales by mill, I identified mills operated by cooperatives and producers' associations, to measure the percentage of coffee sold each year in a district by cooperatives. I then aggregated this level for the 1999-2000 to 2000-2002 (%Coops1999-2013) period as a baseline average, and took the longer average over the entire study period 1999-2000 to 2012-2013 (%Coops1999-2013) as an indicator of the institutional orientation of coffee sales in a district. I used two periods to examine the effect on the response variable (land use change) by 1) the baseline level of cooperative market presence (% sold 1999-2002), and 2) the persistence of cooperative market presence in a district over the study (% sold 1999-2012). I elected to use percentage of coffee sold to cooperatives versus the presence of cooperatives because it more accurately represents the importance of this institutional mill type in my target geographies. Moreover, not all cooperatives have similar buying geographies which could have made a measure of the presence or absence (at canton level) or a count (also at canton level) an unreliable indicator.

Table 9-2Descriptive Statistics of Model Components

	Mean	Std. Dev.	Min	Max
Response				
Percent change land in coffee production	-20.16	25.65	-92.07	57.23
Controls				
Rain-Elevation index	1.10	0.19	0.53	1.57
Percent urban population 2000	24.80	34.00	0	10
Percent urban population 2011	48.12	36.10	0	100
Distance to GAM	20.21	32.36	0	151.99
Explanatory: Agglomeration				
Rural population in 2000	3948.26	2992.43	0	17422
Rural population in 2011	2701.04	2294.32	0	11507
Distance to collectors in 2001	1.06	0.74	0.36	5.56
Mills purchasing coffee in 2001	*5.91*	*3.14*	0	*14*
Mills purchasing coffee in 2012	6.64	4.62	0	24
Explanatory: Institutional				
Coops 1999-2002	*0.36*	*0.29*	*0*	*1*
Coops 1999-2013	0.37	0.28	0	0.97

9.2.5 Model Explanations

I first created a model to test for my main institutional control variable, which is the prevalence of cooperatives as buyers in a district, as well as variables regarding spatial access to markets and labor, which together represent the main components of industrialization and localization economies. I hypothesize that that 1) districts with greater spatial concentration of infrastructure in 2001 will retain more land in coffee production and 2) districts with greater cooperative orientation (measured by percentage of coffee sold to cooperatives) will retain more land in coffee production as measured by percentage change in hectares.

To test these hypotheses, I test two similar models with control variables in 2001 and 2011. I use as control variables the Rain Elevation Index, Percent Urban (2001 or 2011), and Distance to San Jose (Kilometers, Average Distance to San José Urbanized Area (2001 Land Use Layer)). I use the Rain Elevation Index to control for the natural endowments of areas for producing specialty coffee. Distance to San José Urbanized Area as a control for urbanization pressures (along with Percent Urban), although along with Rain Elevation Index, it absorbs part of the terroir effect because Costa Rica was settled around proximity to prime coffee growing areas and the four core cities of the San José Metropolitan Area (San José, Heredia, Alajuela, and Cartago) all grew as coffee hubs starting in the 19th Century.

For explanatory variables regarding the institutional orientation of the district I use % Cooperative (2000-2002 and 2000-2013). Regarding agglomeration, I use Rural Population (2001 and 2001) as an indicator of labor availability in a district, and Average

Distance to Collection points in 2001 as an indicator of the concentration of industry infrastructure at the beginning of the study period. In addition, I focus on industrialization agglomeration factors and use the Number of Mills in 2001-2002 and Number of Mills in 2011-2012.

In the case of the Number of Mills, I recognize that this indicator may absorb some endogeneity, especially in 2012. To account for this I regressed this variable against 2001 land uses and it was not significant, suggesting that the amount of coffee in the early period did not explain the later location of mills.

In the final regression I selected an OLS approach with robust standard errors in STATA to control for heteroscedasticity, which I also tested by plotting residuals in SPSS to make sure there was no severe clustering. I also tested the independence of observations in the models using the Durbin-Watson statistic, and for multicollinearity I tested for VIF's under 2.5 and condition index scores under 30. I eliminated one district with more than 100ha of coffee because its absolute change was 200%, which represented a significant outlier from other districts. Before choosing the OLS approach I also tested various models for their Moran's I score to indicate spatial autocorrelation using Geoda, which showed that there was spatial dependency in the location of coffee but not in the spatial distribution of the percent change. Accordingly, because the percent change measure did not show significant spatial autocorrelation I used the OLS approach instead of a spatially weighted or lagged model.

9.3 Results

My model shows that the Rain Elevation Index is the most significant driver in terms of Beta values (0.38,0.40) and coefficients (51.91, 54.90), both significant at the 0.001 level. Regarding the urbanization control variables, Percent Urban was significant in both models (Betas (-0.28,-0.38) and coefficients (-0.21, and -0.27). However, Distance to GAM Urbanized Area was not significant in Model 1, but was in Model 2 (Beta (-0.26) and coefficients (-0.24). Again, the measure for labor agglomeration, Total Rural Population, was not significant in either model. Average Distance to a Receiver in 2001 was significant at the 0.10 level in both models (coefficients (-5.26, -4.59) and Betas (-0.15, -0.13)), but not at the .05 level. In Model 1 Average % Cooperative 2002-2002 is significant and positive (coefficient 15.4, Beta .18) and in Model 2 (15.7, .17). The new variable of Mills Purchasing in 2002 is not significant in the model with variables from the beginning of the study period, but Mills Purchasing 2012 is significant (coefficient 1.5, beta .026) in the model with variables from the end of the study period

Table 9-3 Results Land Use Change Model (CR 2001-2012, District Level)

	Model 1						Model 2						
Variables	Coef.	Std.Err	t	P>t	Beta	VIF	Variables	Coef.	Std.Err	t	P>t	Beta	VIF
Rain-Elev index	51.90	13.73	3.78	0.00	0.38	1.24	-	54.93	13.42	4.09	0.00	0.40	1.48
Distance to GAM	-0.12	0.08	-1.60	0.11	-0.15	1.17	-	-0.20	0.07	-2.89	0.00	-0.26	1.32
Distance to collectors	-5.26	2.83	-1.86	0.06	-0.15	1.20	-	-4.59	2.46	-1.87	0.06	-0.13	1.11
Percent urban population 2000	-0.21	0.05	-3.87	0.00	-0.28	1.28	Percent urban population 2011	-0.27	0.05	-5.31	0.00	-0.38	1.46
Rural population in 2000	0.00	0.00	-0.91	0.37	-0.07	1.41	Ruralpopulation in 2011	0.00	0.00	-1.06	0.29	-0.09	1.84
Coops 99-02	15.39	6.26	2.46	0.02	0.18	1.09	Coops 99-13	15.90	5.34	2.98	0.00	0.17	1.13
Mills purchasing coffee in 2001	0.82	0.69	1.18	0.24	0.10	1.46	Mills purchasing coffee in 2012	1.45	0.36	3.98	0.00	0.26	1.35
Root MSE	22.71							21.06					
F(7, 152)	10.39							14.94					
Prob>F	0.00							0.00					
R2	0.25							0.36					
AIC	1461.19							1437.01					

9.4 Discussion

The strongest predictor variable in the models tested in this study is the Elevation and Rainfall Index, the standardized regression coefficient in these models shows it to be twice as important as any other variable. This shows a clear trend for coffee in Costa Rica to migrate to areas with higher elevations and more favorable rainfall patterns, reflecting similar patterns in other Latin American countries (Rueda and Lambin 2013a). This represents the tendency of new world coffee to produce for the specialty markets. I also observe across all of my models that as the population of a district becomes more urban, there was less resilience to the coffee crisis. However, this was mediated by the fact that proximity to the GAM's urbanized areas was positively correlated in Model 2. What this indicates is that growing conditions and industrial organization around Costa Rica's Central Valley may have fostered coffee growing resilience, but that urbanization from the city could overcome these conditions, which is consistent with previous findings in Costa Rica (Pujol et al 2010). Location near the Central Valley provides access to many exporters, to a variety of purchasers, and location in the areas of the country with the strongest international reputations. However, even historic production areas, such as Tres Ríos, have seen declines from urbanization, which is reflected in this model. If not for the threat of urbanization, cities may be positive for coffee, but the model also suggests that urbanization may be a threat for marginal coffee producing regions.

Total Rural Population as a measure of labor agglomeration was not significant in any of my models. My findings may reflect a relatively low sample size, but they may also reflect the fact that rural labor supply in Costa Rica is more uniform than in Colombia (Rueda and Lambin 2013a), or that the labor supply alone is insufficiently descriptive of the complexity of household variables that affect economic decisions driving coffee land use (e.g., Bossellman 2013). The other possible explanation is that most farm-level work throughout the year on coffee farms can be performed by a relatively small number of workers, and that in Costa Rica the peak times of labor demand are supplied by migrant labor, often from Panama or Nicaragua. The availability of migrant labor may be less plentiful in areas where coffee growers are poorer, such as Mexico or new coffee frontiers in remote areas of Colombia, and thus this result may reflect Costa Rica´s condition of being relatively affluent, in between but very near poorer Nicaragua and indigenous adjoining areas of Panama.

In terms of the agglomeration factors, the measure Average Distance to Receivers, was significant at the .1 level and negative (indicating that going farther away from the receivers is a disadvantage, and proximity is an advantage). The coefficients for this variable (Model 1 -5.26, Model 2 -4.29) suggest that if mills in a district were on average 1 kilometer closer to farms in 2001, there would be a .15 to .23 increase in the relative percent change in coffee in those districts.

The final agglomeration variables were Mills in 2001 and Mills in 2012 in each of the districts measured (these were the mills with registered coffee sales in the district, not mills located near the district because I lacked a shapefile for mills location in 2001). The Mills in 2001 variable was not statistically significant in predicting land use change, which I interpret as indicating that the patterns of mill purchasing in 2001 were ill adapted for changes that happened in Costa Rica during the 2000s. Notably, the number of mills in Costa Rica grew from 97 in 2002 (from even less in the late 1990s) to 182 in 2012 (and has continued to grow) even as the total annual harvest dropped by over a third (ICAFE).

The result has been an institutional change from an industry principally organized around large nationally owned mills up until the early 2000s, to one where there are ever fewer large mills and most of these are owned either by multinational commodities firms or cooperatives (Figure 9-3 Comparison of Number of Medium to Large Mills in CR 2001 and 2012 (ICAFE) in Fanegas (roughly 100 pounds green coffee)).

Figure 9-3 Comparison of Number of Medium to Large Mills in CR 2001 and 2012 (ICAFE) in Fanegas (roughly 100 pounds green coffee)

The Multinational firms entered milling in Costa Rica in the 2000s, buying many faltering national mills, which had started to own systems of mills in different regions, as opposed to cooperatives which tend to be locally embedded in one region. However, the main change in milling institutional ties was the emergence of smaller private mills and producers' associations oriented towards specialty markets or direct exporting. This trend is clear in Figure 9.4, where one observes that in 2002 there were less than 20 mills processing less than 5,000 fanegas in 2002, whereas there are now more than 120.

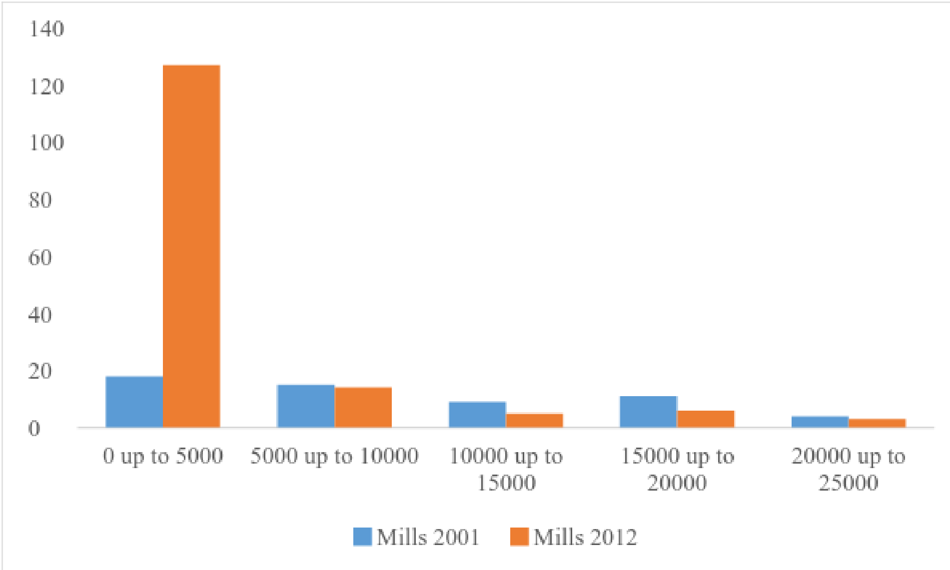
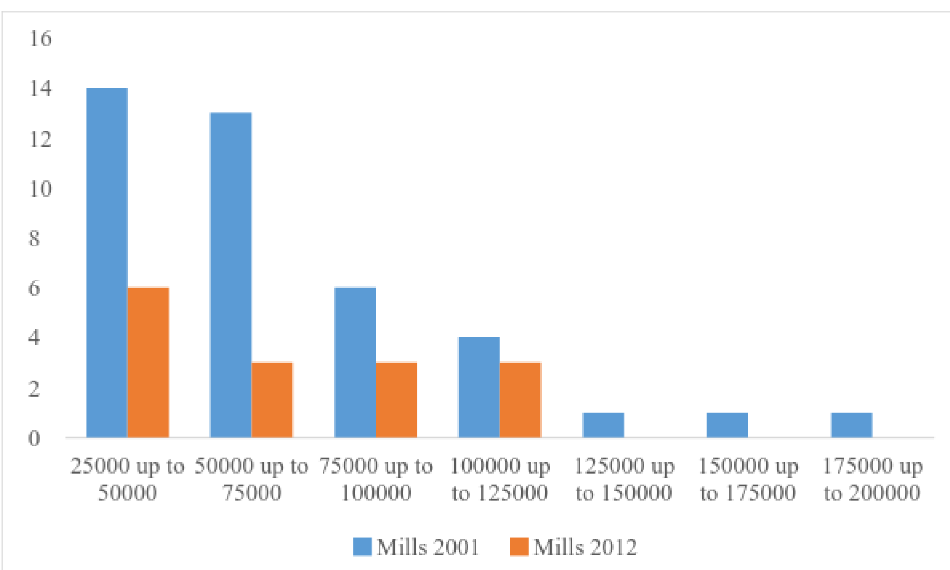


Figure 9-4 Comparison of Number of Small and Micro Mills in CR 2001 and 2012 (ICAFE) in Fanegas (roughly 100 pound bags)

Part of this has been the micromill revolution (Mena 2014) where many small farmers previously, and sometimes continuously, associated with cooperatives (and sometimes other private mills) break off and form on-farm mills for their family´s coffee for small specialty roasters, often selling carefully selected microlots through special export brokers. This can be observed in Figure 9.5, which shows that



very small mills were almost nonexistent in Costa Rica at the beginning of the study period.

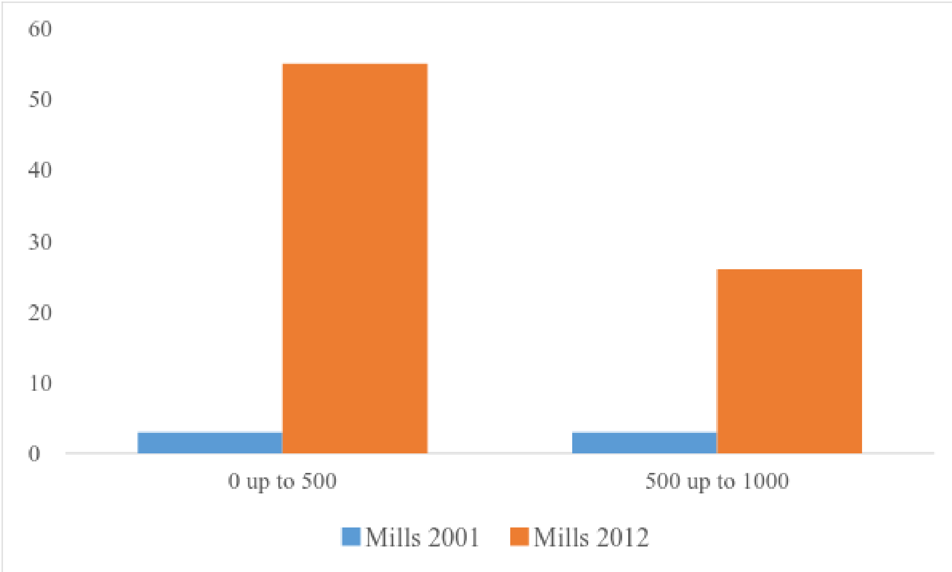


Figure 9-5 Comparison Number of Small and Micro Mills in CR 2001 and 2012 (ICAFE) in Fanegas (roughly 100 pounds)

The changes in the configuration of milling institutionally changed the geography of coffee, and this is represented in Mills in 2012 being significant at the .01 level, and having a coefficient of 1.45 and a beta of .26. This makes it an important variable suggesting that for every 1.45 new mills there is a 1% increase in retaining coffee land use. To some extent this variable is confounded as an outcome, but it does shows that areas of the country that could develop new milling institutions did better. I argue that this, at least in part, is part of a system of adaptive efficiency where local industrialization economies and institutional mix, combined with natural factors exogenous to the model, influenced these changes.

My final variable representing the institutional orientation of the sub-cluster is % Cooperatives 1999-2002 and % Cooperatives 1999-2013 were significant at the .05 or .01 level in each of the models. In my models, the coefficients were 15.9 and 15.39

respectively, with betas placing this variable after the other significant variables in terms of its effect on the model (See 9.3). From these results, I cannot fully conclude that cooperatives caused coffee resilience, but these results buttress my argument that cooperatives in Costa Rica are an important milling institution within a sub-cluster because of their local embeddedness, ability to provide services for members, and long-term commitment.

CHAPTER 10. CONVERGENT ANALYSIS

In this chapter I review my hypotheses considering a convergent analysis of my findings in Chapters 6, 7, 8, and 9. I go through the hypotheses one by one, and in the order of their presentation in the model. Then in Chapter 11, my conclusion section, I discuss the entire model, and its relevance for planning. The convergent analysis, is an effort to triangulate the findings of my methods regarding the comparative cases, qualitative data, social network data, and regression approach. By doing so, I will summarize my general findings, and discuss potential areas for future questions and issues with the reliability and validity of these results.

10.1 Institutional Hypotheses

10.1.1 Hypothesis 1: Clusters with strong cooperatives will be relatively more resilient

My regression model (see Chapter 9) found a statistically significant correlation between the percentage of coffee sold to cooperatives, and the retention of land use in coffee. The information provided in my interviews shows that cooperatives have a long-term stake in their home regions, and seek a wide range of collaboration, ranging from government programs, to international NGOs. Furthermore, education, training, cooperation with other firms, and concern for community are core elements of the cooperative movement (ICA 2015). This educational and training function, as well as concern for community, helps explain why cooperatives in both Mexico and Costa Rica played a pioneering role in upgrading through environmental and social certifications.

They were willing to seek out new solutions for their members that reflected evolving notions of sustainability, and new market opportunities.

Observing pro social elements of cooperatives is not a novel finding of my research. As I described in my literature review, work by contemporary authors shows the important roles cooperatives play in certifications, in adaptation, and in building social capital (e.g., Snyder et al 2016). What I do contribute is the cluster perspective, and the finding that the pro-social orientation of coops has an impact locally not only through the direct role they play with their own members, but also through introducing new practices and values to the cluster. Well administrated cooperatives create resilience externalities for the cluster that go beyond the impact of private counterparts. Cooperatives do not have the opportunity for regional exit, because of their membership, and so they have greater incentives for in situ innovation than firms guided by investment capital.

During the depths of the coffee crisis, cooperatives created new markets in sustainable coffees, adding value to their products, and seeking new financing and risk management practices. Many of these adaptations included building direct relationships with long-term buyers, as well as with new financial entities (e.g., Root Capital), and sources of knowledge (e.g., universities). In the areas of my study where cooperatives were successful, such as both Costa Rica High Coop cases and the Chiapas cases, they played central roles in building the regional reputation.

What is important from a resilience perspective, is that they protected the stability of their clusters, in a period when other firms were closing or reducing investments in farmers because of low international prices. The role cooperatives played in the comparatively more resilient clusters (see Chapter 6) could be seen both in terms of my network and my case study results, and signals that they produce positive externalities in terms of cluster resilience.

Mexican cooperatives in Chiapas gave indigenous communities a first channel of access to participation in the global economy, and a way around the purchasing agent (coyote) system. But these organizations are precarious because they must compete against other firms with much stronger international finance and logistics mechanisms. I observed several cases of failed cooperatives, and failed cooperative export alliances, which damaged resilience. In Mexico, there are not strong mechanisms to provide local cooperatives with the financing and resources needed to incorporate the same majorities of farmers that I observed in the High Cooperative cases in Costa Rica.

Most cooperatives in Costa Rica sell conventional coffee, and many members in the High Cooperative cases are medium to medium-large holders. Mexican cooperatives are principally engaged in supporting organic growing, without the presence of larger farmers. This function of supporting poorer farmers is very important for social resilience (see Eakin et al 2011, Martinez 2007), but limits them as business organizations in the absence of strong mechanisms for support. Mexican cooperatives emerged in a competitive environment of crisis during the 1990s, whereas Costa Rican cooperatives began in the 1960s and enjoyed strong government regulatory support from the beginning. Thus, for historical reasons, Mexican cooperatives had less capacity than those operating in Costa Rica, but they were equally entrepreneurial in the value chain in terms of adaptation.

Descriptive statistics (see Chapter 6) also show that High Coop regions in Costa Rica rebounded from economic crisis more strongly in terms of production, and the creation of new mills in the cluster. This happened, however, after a period of acute crisis for cooperatives, when many in Costa Rica closed, and their models were challenged. This observation highlights a weakness of my case design in terms of conclusively tracing a line between cooperatives and cluster resilience. I focus on regions where, for the most part, cooperatives persisted. If I had, for example, focused on the period between 1990 and 2005 in Costa Rica, I would have seen how a series of cooperatives with poor risk management closed. The problems some cooperatives face in acute crisis may explain why land-use and production plummeted in High Coop cases during the depths of the coffee crisis, while the same crisis elicited an adaptive response, with cooperatives seeking out new models of sustainability, access to specialty markets, and improvements in internal firm governance in the mid-2000s.

The initial vulnerability of cooperatives to the coffee crisis highlights a weakness of their model of organizing processing around farmer members, rather than investment capital. The lack of external backing is a challenge for developing institutional capacity and economic competitiveness, for an organization with limited access to capital and business expertise. Many cooperatives in this study overcame these barriers through long-term state support and member effort. Cooperatives can also be threatened as anchor firms in a cluster because of problems of internal management. Losing key mills, without replacements, is a major problem for cluster resilience because it removes traditional structures of knowledge and support for farmers in the cluster. Institutional capacity and stability is an important caveat to my finding that cooperatives contribute to cluster resilience.

10.1.2 Hypothesis 2: Cluster resilience will correspond to areas whose institutions encourage value chain upgrading

In both Costa Rica and Mexico, resilience required not just adaptation by embedded local organizations, but also new firm types to respond to an evolving international coffee market (Samper 2010). In Mexico, firms evolved through the emergence of cooperatives based around the Fair Trade and Organic models. This well-told story (e.g., Martinez 2007, Jaffe 2007, Bacon 2005) happened with some government support for organizational creation and infrastructure acquisition, but with very little capital support or programs to facilitate extension or support farmers. The cooperative movement in coffee led to the creation of new certifying NGOs, e.g., Certimex; more recently, organizations such as Impacto Café have emerged to support business upgrading.

Cooperatives in the Mexican clusters pioneered this new market segment for certifying NGOs. Thus, their role was even more important for small holders than in Costa Rica. Cooperatives in Chiapas enjoyed fewer resources and faced greater obstacles than cooperatives in Costa Rica because of the comparatively higher levels of social and economic disadvantage of their members. Seen from one perspective, in Chiapas cooperatives built clusters of organic Fair Trade certified production out of nothing in the 2000s, with very little support, and sufficient success to attract international buyers, such as Starbucks. Cooperatives in Veracruz followed similar strategies, and found markets with important buyers, but the preponderance of conventional farmers in the Veracruz cluster took away part of their competitive advantage and may have impeded their consolidation as lead firms.

In Mexico, cooperatives have formed together as second level export unions to aggregate coffee and create economies of scale in marketing. Unfortunately, many of these unions have been unstable, which has caused problems for producers due to bankruptcies and problems with cash flow liquidity. Part of this is due to the challenges faced in incorporating new members. Many cooperatives have faced stable or declining memberships, which makes volumes and logistics more difficult and expensive. Smaller memberships, especially in areas of low yields, also means that there is less surplus for institutional development. If cooperatives do not process volumes of coffee comparable to that of private and multinational mills, it is hard for them to compete, and to contribute locally.

Compared with private firms, cooperatives take longer to start and to accumulate capital, and private firms can move in more quickly if a coop fails. Weak cooperatives pose a problem for farmers, because they often take harvested coffee with the promise of future payments, and are not able to make pro-social investments, or sponsor support for farmers in terms of providing access to capital, knowledge, and better prices. Cooperatives in Mexico have lacked resources to purchase most coffee grown in their clusters, which diminishes their organizational impact compared to the high cooperative clusters in Costa Rica.

Large cooperatives in Costa Rica that survived the coffee crisis became much more sophisticated businesses on a variety of fronts, ranging from risk management, to export logistics, to marketing (e.g., Parizat 2015). This was the case for the larger cooperatives in both the Prime and Non-Prime Cases. In Costa Rica, because of the work done by cooperatives in the early 2000s, the national industry in many areas could modernize through developing sustainably sourced coffees for the specialty market (Samper 2010).

In the most resilient areas, such as the High Coop Prime case, cooperatives offered a fallback for farmers opening their own smaller mills; these mills benefited from the knowledge spillovers produced by the educational missions of cooperatives and producers' associations. They also tend to create a price floor to keep other buyers honest in periods of lower international prices. In addition to the largest coops, smaller and newer cooperative producers' associations, most of which are focused on organic coffee or specialty microlots, represent a new formulation of the cooperative idea in areas which are adjusting to the coffee market and dealing with attrition from traditional structures, or seeking niches outside mainstream coffee channels (Snyder et al 2016). Organic and low input farming has been an adaptive strategy in some areas of Costa Rica, but the Fair Trade and organic model for cooperatives is only prevalent in non-prime areas in Costa Rica. However, ideas of cost reduction through agroecological efficiency have percolated heavily into conventional growing in Costa Rica, especially though participation in certifications and the emergence of more individualized farm management programs. Within this trend, cooperatives played a central role, and were pioneers in the country's coffee NAMA plan for a carbon neutral coffee industry (ICAFE 2014).

In Costa Rica, both the High Cooperative cases saw an emergence of micromills. This was a self-organizing adaptation to market conditions, but in both cases in the mid-2000s, local mills eventually came together to form bodies representing these new institutional actors. In both cases, they were supported by a non-traditional source, the Ministry of Agriculture, which is a secondary government agent in coffee. The initial idea was that they would build common local infrastructure for their members to share, such as dry mills and warehouses, acting as export platforms. In this sense, they aimed to lower transaction costs through collective action, and provide mechanisms to solicit state support and to speak as a united voice on policy issues. These are clear cluster intermediary roles, but the producer associations have not consolidated the participation of a wide range of actors, although the organization of micromillers in the Non-Prime case has the participation of many smaller cooperative producers' associations as well as private micromills. This may suggest that localized intermediaries are more valuable for small independent organizations, and that without a strong incentive, larger organizations may not see a clear benefit in local collective organizations.

10.1.3 Hypothesis 3: Communal land tenure will lead to lower levels of on-farm investment and upgrading in the absence of strong public mechanisms to support farmers. These differences will primarily manifest themselves at the national level.

Comparing Mexico and Costa Rica, the prevalence of very small parcels of land holding in the Mexican social sector is an impediment to a resilient coffee industry, at least within the current global coffee commodities-market paradigm. In the absence of a comprehensive state-sponsored program to support agriculture on communal land, no clear credit mechanisms exist to support investment, and small holder farmers may produce so little that transaction costs for lending and other mechanisms of support are prohibitive.

The historic state subsidization of coffee through INMECAFE suggests that farming within common property systems requires large public organizations that can create support mechanisms in conjunction with value chain actors. Without a support system, and in a context where tenure is splintered into very small holdings, the coffee chain Mexico has become captive to purchasing agents, in part because of transaction costs. The dominance of purchasing agents as the means of organizing small holder coffee supply chains is a major barrier to investment and resilience in Mexico's coffee industry. This creates a vicious circle. Small holders can't invest in new plants or fertilizers or new techniques, so they produce coffee of low quality leading to lower and lower prices. Purely cash relationships cannot support an agricultural cluster, and areas where processing firms did not coordinate more comprehensive support for small holders were particularly vulnerable. In theory, communal lands could overcome this problem of size, but in practice Mexican parcels are managed individually, and there are not strong financing mechanisms to channel investment into common property. The problem seems to be the lack of institutional structures of support. Titling and free hold property does not solve these problems, and in neighboring countries private title has not led to greater efficiency (Montaner 2011).

The effects of this on long-term resilience can be seen in Mexico's very low yields. One could argue that these landholding patterns simply reflect different forms of social organization and values where coffee exists with traditional farming in mixed-crop subsistence systems. In fact, a wider lens of resilience understands that coffee exists to support wellbeing within existing social structures that are valued by community members. However, the mismatch between the global political economy of coffee and communal and *ejido* land tenure patterns are central to Mexico's inability to support small holders to renovate and invest and left the country vulnerable to a devastating coffee rust epidemic. Low yields mean that rural families have lower incomes and greater levels of poverty. This is an observation about the Global Value Chain for coffee in its current state, and does not suggest that there is anything inherently less resilient about common property regimes.

10.1.4 Hypothesis 4: Clusters where producers are primarily from historically marginalized indigenous cultures will have weaker networks with external actors within public institutions and the coffee value chain. These barriers will affect resilience.

The case of Chiapas Indigenous demonstrates the challenges linguistic minority communities face trying to integrate into the economic structures created by dominant national cultural paradigms. Issues of historical injustices, linguistic barriers, cultural misunderstandings, and mistrust permeate the cluster. These issues create institutional barriers to cooperative relationships with the state and with firms anchored in other cultural paradigms. Furthermore, cultural minority status and economic disadvantage interact, to create much more vulnerable cluster organizations. In part, indigenous groups in Mexico have dealt with this problem by interacting more directly with international markets. They have built persistent organizations that are oriented toward Fair Trade, linking their communities with international customers who want to show solidarity in their consumption habits. These alternative trade channels make special efforts to create a context for small coffee farms to succeed and promote and adapt to the cultural differences of indigenous producers. All of this, however, happens in a relational context where there is friction with multinational firms and state actors. Indigenous growers became farmers after decades of subjection as farm laborers, and did so in great part despite vested interests in the Mexican state and traditional coffee growing elite.

While Chiapas Mestizo and Chiapas Indigenous had similar density of local ties, Chiapas Indigenous had very few ties with multinational corporations, and lower trust in them. In general, many of the organizations in Chiapas did not have sufficient size and capacity to cultivate relationships with outside actors, except those engaged in Fair Trade, development, and organic farming. The network was not significantly different in terms of internal structure, but there were fewer ties to traditional business actors, the government, and larger firms not involved with Fair Trade. Part of this is the model of the firms there, but additionally, for many of the smaller organizations, language may be a barrier, as well as the fact that they are involved in an alternative model of agriculture which is marginalized by traditional business channels and the Mexican state.

Cooperatives in the Chiapas Indigenous case also described abandonment during the coffee rust epidemic. While cooperatives could stake out a place for their members in alternative trade networks, state support mechanisms tended to be weak. Numerous cooperatives in the region reported strong relationships with Fair Trade buyers and NGOs, but in general the cluster had fewer ties to outside institutions, such as financial and exporting firms. My network scores in Chapter 7 validate this conclusion.

This relational deficit with mainstream power structures, both commercial and political, may be a barrier in accessing resources, and may indicate the relative isolation of producers here. When a cluster does not develop, and the overall governance network for coffee is not locally robust and fully integrated into the larger industry, firms and producers are left isolated and vulnerable in times of crisis. This is clearly the case in Chiapas Indigenous. Despite the work of producers' organizations to develop new Fair Trade and organic production models, outside support mechanisms from the value chain are minimal.

10.2 Relational Hypotheses

10.2.1 Hypothesis 5: Cluster resilience will correspond to stronger social networks and social capital within the cluster (akin to bonding capital).

10.2.1.1 More cohesive collaboration and knowledge networks

Stronger cluster networks were associated with more resilient cases, and High Coop regions show higher centrality and higher scores for measures of group cohesion. Areas where the larger mills were more socially embedded showed more resilience. While not causal, the type of institution may play a role in determining the strength of the network and potential resilience, because adaptation "… is likely to occur in societies historically rich in networks and associations that provide the social ties, norms, and resources that enable individuals to cooperate in the provision of collective goods and diffusion of knowledge." (McDermott 2007). My study confirms the long body of research that local social capital is important for long-term economic performance.

Costa Rica Prime High Cooperative exhibited strong social capital and a commitment to the coffee industry at the community level. Cooperatives fostered this environment, and were central actors, but the environment also allowed for the creation of new firms, especially micro mills, and systems of mutual support. In this region, micromills formed their own networks of support and collaboration, including a group to represent them. This may suggest that the underlying social capital in the region fostered successful cooperatives, but the central role played by the cooperatives in acting as knowledge gatekeepers for the entire cluster suggests that this is a self-reinforcing cycle.

In contrast, the networks in Costa Rica Prime Low Cooperative were less dense. Furthermore, respondents reported that the entire cluster area had suffered from the demise of cooperatives, and that in general people were not willing to make efforts to improve collective goods in the area, such as working on reputation, or common problems. Much of this had to do with the closure of many of the historical mills in the region, and the fact that many land-owners were absentee. The social capital of the industry actors was not locally embedded, and the locally embedded social capital was less directed towards coffee.

These trends were mirrored in the Veracruz cases, although there, cooperatives played less central roles. However, the local embeddedness of many of the private mills helped to maintain the region's identity with coffee, and to foster self-organizing collective adaptation. The existence of a strong network of locally anchored mills, of which cooperatives played an important part, distinguished the case from Veracruz Low Cooperative. In areas without locally anchored mills as their lead firms, I observed lower group cohesion, which may further affect cluster identity and collaboration.

10.2.1.2 Locally anchored institutions (especially cooperatives) as both gatekeepers of knowledge and policy advocates

From a knowledge development and collective action perspective, the importance of cluster-based firms results from housing locally based technical and marketing staff.

Without the local presence of professionals dedicated to innovation in the industry, cluster development is difficult. Clusters with weaker local institutions rely on multinationals with hub offices, as opposed to local branches, or locally owned mills. These relationships are often beneficial for the organizations involved, but from the perspective of local industry, the dominance of multinationals can be problematic because extra-local experts and GVC brokers may not have local interests at the core of their strategy, and they tend to avoid investing in regional infrastructure with a long-term view.

In Mexico, where regulations lack strong protections for growers, many private companies operate primarily through purchasing agents, and thus contribute minimally to developing local industries. When private firms in Mexico do offer support services for growers, they are often contingent on roaster-sponsored programs, such as Nespresso AAA. A variety of actors in Mexico, ranging from representatives of multinationals, private mills, cooperatives, government, and NGOs, noted that the purchasing agent model significantly impeded the industry's development of farmers. It also appears to impede cluster network development, by taking management a step away from on the ground development.

There are also the issues of multinational mills. From their hubs they contribute greatly to the national industry; my interviews identified important collaborations between multinationals and universities, as well as key intermediary organizations (such as SCAACR). These firms have an advantage in terms of accessing global pipelines of information and resources. The problem with multinationals and long term cluster resilience, at the scale I study here, is, from a relational perspective, twofold: 1) they tend to concentrate knowledge-related staff in central offices, and 2) in Mexico, their local presence is typically via purchasing agents. The lack of on-the ground presence of multinationals is clear in my networks, even in a case such as Costa Rica Prime Low Cooperative, where multinationals are the lead mills. This institutional strategy has clear ramifications for clusters: where multinationals play preeminent roles, they may create less localized spillovers to other firms. In some cases, multinationals have started to dedicate regional staff and resources to assisting farmers who sell to them through sustainability programs. These programs are generally concentrated in areas with pre-existing interest from buyers and coordinated certification programs, and in many cases, involve local universities and NGOs. However, these operate more like external stars than gatekeepers from the perspective of a cluster. They tend to rotate agronomical staff, and contract to provide services. Because the agronomical knowledge is through the sustainability programs versus the mill operation itself, the presence of these programs (even when they are equally robust to those offered by cooperatives) does not translate as directly to localized learning, as it does in the case of strong cooperatives.

Large private mills connected to large land holdings could have similar commitments to the local clusters as cooperatives, but my research found them to be more inward looking, although in some cases they did act as gatekeepers by default. Where this was the case, cluster networks were small, and small holder production was declining.

In Chiapas Mestizo, the local estate mills operated in their own semi-closed network parallel to the network of cooperatives. For them, local collaboration happened with peer firms in the cluster (other estates), and multinational hubs, with which they had deep commercial and collaborative relationships because of long-standing family and friendship ties, which have allowed them to develop commercial relationships with important international buyers, and to coordinate purchases of materials and agrochemicals to lower costs. They are also in contact regarding methods and agronomy innovations. In part, their situation is unique because they are high intensity farmers in a region where most farmers are small holder/low-input farmers, and thus their commercial and business reality differs from that of the cooperatives. In Costa Rica, this dichotomy between large conventional farms and small holders is less pronounced, both socially, and in terms of growing practices.

10.2.1.3 <u>More trust and collaboration around key resilience topics among local firms</u>

My evidence to supports this hypothesis at the local level is somewhat inconclusive. For example, in the case of Costa Rica High Cooperative, the qualitative data from cases showing higher levels of adaptation, and quantitative data reported in Chapter 6, do not coincide with differences in trust measurements. They do however, coincide with qualitative data regarding trust and collaboration in Chapter 8, and with scores regarding collaboration around cluster governance issues reported in Chapter 7.

Where the connection to resilience is more tenuous, is in the two Non-Prime cases in Costa Rica. In both areas, production has declined along a similar trend line; while land use loss in the High Coop Non-Prime case has been less than in the Low Coop case, it is still severe. Perceptions of cooperation in this cluster were more positive qualitatively in the High Coop case, but quantitatively trust levels did not differ. In the High Coop case I observed more diverse adaptive strategies aimed at the cluster, ranging from supporting micromills to a series of newer producers’ associations and a cluster organization. What may occur in these cases, is that the perceptions of collaboration and trust are affected by the trajectory of the local industry, which has been on a decline in both the Non-Prime cases.

I also observed how different types of firms act in cluster networks. Research in wine has contrasted clusters where lead firms act as gatekeepers, to ones where they act as external stars (Giuliani 2007, Morrison 2009). All firms I interviewed cultivated knowledge and relationships within the GVC for their own benefit, but cooperatives also sponsor frequent learning and knowledge related relationships, consistent with developing long-term resilience of the cluster. They frequently serve to host workshops, meetings, and other learning oriented events. They also appear to be important gatekeepers, and conveners. This is not to say that cooperatives are always altruistic, but the most successful cooperatives are deeply socially embedded, and committed to the local industry, which makes them more likely to engage in activities that generate spillovers and contribute to collective goods.

Cooperatives may use valuable knowledge and relationships with external actors as club goods with some degree of exclusion. Although they do not actively share all information with competitors, they do often develop relationships through common associations and certifications. The largest cooperatives also have affinities and relationships with multinational exporters, even though some within the organizations on both sides harbor the attitude that the others are not honest competitors.

Maybe because of the diversity of firm management structures and interests present in coffee, none of my cases included a cluster intermediary aimed at representing a large swath of organizations. In Costa Rica High Coop, there is a cluster organization clamoring for an autonomous denomination of origin, and while cooperatives are present in it, it has a contentious relationship with ICAFE. Hira and Swartz (2014) note that there is a lock-in effect once a regional reputation is established, and that denominations of origin are most successful as reinforcement mechanisms. This may help to explain why clusters under stress have developed few common institutions to improve local reputations, or reduce transaction costs. In Chiapas and Veracruz, efforts to create state level denominations of origin failed because of weak organizational structures, and problems with buy-in. Costa Rica has developed a more regional approach to denominations of origin, but it has done so centrally, and the results of this program are still uncertain.

One distinguishing characteristic of Mexico versus Costa Rica in my study, is that the cooperative organizations in Mexico's clusters tend to be much smaller, more numerous, and fragmented than in Costa Rica. This makes developing a reputation and relationships with buyers and powerful GVC actors more difficult. They thus are often members of larger second-level cooperatives. In Chiapas, an independent body, CoopCafe, acts as an intermediary for cooperatives, but no such body exists in Veracruz. At the cluster level, I observed occasional business collaboration among Veracruz cooperatives, but no organizations to represent them as a group. Part of the problem in cluster development in regions with larger mills may be that the lead firms are aggregators, unlike wineries who develop their own brands, and are thus less likely to invest in common infrastructure when they are in a constant competitive struggle with other local mills.

10.2.2 Hypothesis 6: More resilient clusters will have more open knowledge and collaboration networks (akin to bridging capital).

10.2.2.1 More and stronger links to external actors in the coffee GVC

The most successful clusters were more resilient, in part because they could seek out relationships with external actors. In general, as mentioned above, Costa Rican mills had more contacts with GVC actors, and greater trust in their relationships with public institutions. In the resilient Costa Rica Prime case, the mills had higher levels of contacts with outside actors in the GVC. They also had locally embedded mills with strong capacity to build GVC relationships through diverse commercial activities, trade fairs, and participation in industry governance nationally and internationally.

My land use model shows that natural production advantages have an impact on where coffee persisted in Costa Rica, and cupping competitions are also crucial for reputation. Both factors seem to attract interest from the GVC, both in terms of support and relationships. This suggests that openness regarding market actors is in part a question of selection by those who hold power upstream in the GVC.

The clusters that were most resilient were those who could evolve a strong mix of traditional and new firms, and cultivate relationships with external intermediaries expert in facilitating "direct trade" and microlots. Most of these were sold by micromill farms, who represented a small part of the total volume, but were very important in innovation. Along with these new firm types, new intermediaries emerged in the form of specialty brokers. The new specialty coffee brokers who focus on direct trade are geographically selective. They engage client mills in the areas of highest potential for cup profile, which are also the most resilient regions in Costa Rica. They also tend to be organizationally selective, and to operate as external stars with external actors.

On the opposite end of the spectrum regarding capacity and resources are multinational companies, who are the ablest to access capital. In successful areas, such as the Prime area of Costa Rica, Veracruz High Cooperative and Chiapas Mestizo, multinationals have reacted to the headway made by cooperatives in environmental and social certifications, as well as sustainability and farmer support, by establishing their own certification programs, linked to international networks of buyers and NGOs. In one case, they operate such a program in the absence of a cooperative, but this is an outlier.

The difference, from a territorial perspective, between cooperatives and multinationals is that the development of capacity to interact with learning and knowledge networks within the global industry and education happens at the local level with cooperatives, and at the country level in central offices in San Jose with the multinationals.

From an organizational perspective, the benefits of concentrating program management in central offices are clear in terms of economies of scale, capacity, and costs, but in terms of local development, the distance means that the regional programs are more diffuse and involve fewer local actors. A cooperative may develop a program in hope of finding a lucrative market, or with the help of international aid, and nearby cooperatives and mills may see it succeed and adopt it, with the result that the values and practices of these programs start to spill over into local networks, and gradually become embedded in the culture of the cluster.

Multinational firms are much more foot-loose and I observed many instances of firms opening and closing mills in regions depending on market conditions. In part, this results from an excess of milling capacity in both countries, but it also demonstrates that presence in a locality is not the mission of multinationals, rather the contingent result of a global strategy.

However, locally anchored institutions alone are not a panacea, because they need to have adequate capacity to serve as gatekeepers of knowledge, and to encourage the creation of forums for promoting collective actions. If there are too many weak groups, even if they are strongly locally embedded, they may lack adequate resources to serve as a broker in the GVC. This is exacerbated in marginal groups like isolated indigenous communities. In these sectors, multinationals are playing a role and the involvement of certifying NGOs may help anchor these firms and provide much needed technical-social services. All large cooperatives I interviewed offered certification programs, comprehensive agronomical support, credit, and supplies. In many instances, private buyers, including multinationals, did not offer these services, and instead, competed through faster payment systems. Where they did offer services, they did so through buyer-driven programs that were strongly weighted towards areas with strong pre-existing reputations.

10.2.2.2 More collaboration and trust with publicly oriented institutions (e.g., government, educational institutions, and NGOs)

In my case comparisons, it was hard to distinguish differences in patterns of collaboration with government at the cluster level, although I did observe differences at the national level. It may be that, given the paucity of cluster-level governance in coffee, collaboration with public actors is more of a question of organizational culture and capacity. The most successful mills across cases tended to report a range of collaborations with publicly oriented institutions, ranging from collaborative agronomical research, to program development with the government. To the extent that the more resilient regions have more of the successful mills, collaboration rates should vary between resilient and non-resilient clusters, but I was not able to document clear differences using clusters as my unit of analysis. As I discussed above, the management structure of locally managed cooperatives and other locally managed firms means that they tend to relate to the government in ways that are more embedded in the territorial perspective of the cluster than firms managed from afar.

What is possible is that more resilient clusters may elicit more entrepreneurial projects from the government and other institutions. For example, in both High Cooperative cases in Costa Rica, the Ministry of Agriculture had a strong role in sponsoring the creation of micro-mills. In the Chiapas Mestizo case, there is a history of collaboration with conservation organizations and NGOs. Fully investigating this hypothesis within the context of the coffee industry is a question for future research.

10.2.3 Hypothesis 7: Larger national patterns of social capital influence cluster resilience.

My results from both the qualitative interviews and the social network surveys suggest that a distinguishing feature between Mexico and Costa Rica is the differing level of social trust. This is particularly manifest in relationships with public institutions. The long term public policy for coffee makes a difference: Costa Rica's initiatives in the 1960s to set up cooperatives created an institutional enabling environment for long-term cohesiveness among farmers, and systemic support mechanisms for them. The institutional enabling context needs to be able to foster adaptation, as Costa Rica's ICAFE did when it shifted towards specialty coffee in the 1990s, and Mexico did not when it systematically dismantled its state support ecosystem. In Mexico, outside areas favored by specialty markets, change was a form of short-term coping, rather than resilient adaptation founded in charting a better trajectory for the cluster and its firms.

Trends reflecting underlying social capital varied more between countries than between clusters. Differences between Costa Rica and Mexico in the number of local contacts and trust could also be observed in networks. In general, there are deeper social divisions in Mexico than in Costa Rica, and this could be observed in my cases, where respondents in Costa Rica reported higher levels of cluster collaboration on key issues, such as environmental upgrading, infrastructure development, and innovation.

In Mexico, interviewees expressed a sense that the grower had been abandoned by the state, and that the deregulation of the industry was a major issue, along with the loss of agricultural extension support for farmers and programs to help investments. In Costa Rica the system was never so centralized as it once was in Mexico, but a strong backbone of farmer protection and support remains through ICAFE. Local institutions, mainly cooperatives, have spent decades developing capacity to support farmers, and collaborate in the supply chain, with knowledge intermediaries ranging from universities to NGOs. Accordingly, there is more trust in public institutions and in collaboration than in Mexico. This is not to paint Costa Rica's approach as a panacea: three of my cases face serious challenges, and purposeful collective action at the cluster level was an elusive goal. However, in general, a wide range of productive relationships among ICAFE, cooperatives, private actors, universities, and intermediaries in the coffee industry exists.

In Mexico, mistrust impeded local development, and while cooperatives made headway on some issues, such as Fair Trade and organics, the lack of strong relationships between the industry and public entities, was a major impediment to collaboration. Even in areas where I observed strong networks among cliques of mills, trust in public institutions was weak. The relationship between mills and local government offices was weaker in Mexico compared with Costa Rica, where ICAFE maintains a small local presence. If effective clusters rely on both private and public actors in their networks, the lack of strong government capacity is a clear problem for the coffee industry in Mexico.

10.3 Spatial Hypotheses

10.3.1 Hypothesis 8: Resilient areas will have better access to labour pools and transportation networks.

My regression model did not find that rural population significantly correlated with land use change in Costa Rica's coffee sector, suggesting local labour availability was not a significant factor in resilience. This varies from the findings of Rueda and Lambin (2013) in their study of Colombia's coffee industry, and may be a question of a small sample size, of Costa Rica being a smaller and more homogeneous labour market, or the availability of migrant labour from Panama and Nicaragua. At the same time my case studies show that Chiapas, which has a much larger rural population than Veracruz, was relatively more resilient. This question requires more research in the future.

My regression model found distance to coffee receiving points to be a significant predictor of resilience in Costa Rica. This coupled with Costa Rica's relatively developed road network helps explain how large mills maintain sophisticated systems of same day collections. Moreover, the expansion of coffee in my two Chiapas cases came during the 2000s in a period when the Mexican government expanded the road network in rural areas in response to rural unrest. This was both a counter-insurgency and a development strategy, but it had the consequence of bringing previously isolated areas closer to markets. Efforts to create greater rural access in Chiapas have undoubtedly helped the coffee industry, but many farmers remain very isolated.

10.3.2 Hypothesis 9: Resilient areas will benefit from the industrialization economies provided by greater concentration of industry infrastructure and intermediary organizations.

The presence of local infrastructure, both private infrastructure such as networks of collection points, and public infrastructure in terms of roads, seemed to play an important role in maintaining services, and proximities were an advantage of Costa Rica over Mexico. The Mexican regions were generally more remote, and thus growers had less direct access to suppliers, competing mills, public institutions, and opportunities for both financial support and learning. In Costa Rica, coffee transportation costs are minimized by systems of receiving points, staffed by mill staff during the harvest. However, maintaining this infrastructure is dependent on the productivity and concentration of local farms.

To be profitable, receiving points need to have minimum volumes, which can range from 20 to 50 farms depending on their size. When mills close or reduce operations, these receiving points close, leaving producers with fewer options. Here the loss of territorially anchored institutions has a great impact. The loss of the receivers sends a signal to farmers and reduces their proximity to market competition, which has ramifications for price. In

CR Prime Low Coop, the large milling groups are even more reliant on receivers than other mills including large cooperatives. Therefore, the fact that multinational mills are easily shuffled or retracted, creates an extra layer of vulnerability.

All of this contributes to reduced industry agglomeration as weaker local networks, reduced concentration of activity, and a lack of institutional leadership all interact. Once concentrated agricultural systems start to break down and production declines, this threatens the servicing institutions of the cluster, primarily the mills, but also the plethora of support services, from agriculturally related NGOs, to materials suppliers, and even staff in government offices. In Mexico, this negative cycle could be observed in Veracruz Low Coop, where the loss of coffee farms led to the loss of mills and suppliers and the weakening of the local cluster, and subsequently to less competition and support for farmers. The loss of agricultural concentration was a self-reinforcing cycle. In Chiapas, the overall trajectory of the industry in both cases was positive during the period studied, but farmers were often located in very remote areas. In both cases, cooperatives clustered their management in regional cities.

Remoteness in the Mexican cases may partly explain the prevalence of purchasing agents, the challenges in providing services to producers, and why yields and investment are low. Cooperatives can offer services at a neighborhood level, even in remote communities, but coordination is more difficult, and so are the costs of organization. Spatial concentration may facilitate social organization. While farmers can cope and adapt out of necessity, isolation combined with poverty leaves them vulnerable, as the coffee rust epidemic revealed. Social, institutional, and physical distance are barriers to many indigenous producers in Mexico, and without specific state programs to support their farming and unique production realities, purely market actors have proved unable to buttress a resilient coffee sector.

Spatial propinquity matters, but proximity can exist in two forms: (1) at the production level, in that the mills I interviewed were relationally closest to firms within their cluster, and especially to firms that were physically near them; and (2) at the secondary level, in centers of industry administration, where multinational hubs, exporters, and government tend to co-locate. Proximity was not always a sufficient condition for firms to engage in knowledge and information exchange or collaboration, but it acted as a strong predictor. Neighboring mills often reported strong relationships of knowledge exchange, mutual observation, and friendship. Large mills in towns also tended to be central actors, and while part of this was related to size, they were more active in social networks than more remote mills.

CHAPTER 11. CONCLUSIONS

Much planning literature exists about the importance of local agricultural systems for local economies and sustainable development (e.g., Brinkley 2013, Mardsten 2011), but less is known about the systems themselves, especially in the developing world. This project grew out of a study context where planning solutions implemented by state actors are not currently elements of policy practice. In the field of sustainable development, these contexts challenge planners to reposition themselves to work with evolutionary systems where actors are linked through complex webs of social and economic interdependence.

A resilience perspective for industry clusters recognizes that self-organizing collective adaptation initiated by firms is at the core of agricultural cluster governance in the Global South. At the same time, cluster resilience is connected to the normative concept of sustainability, in as much as much as it understands industries as systems dependent on shared resources, which require collective action, strategic knowledge sharing, and governance to manage. In this sense, resilience bridges the normative social and environmental focuses of sustainability, and the tendency of some development literature to focus primarily on firms and competitiveness. Resilience focuses on the processes and dynamics of change, and as such can be a framework for focusing on short and medium term adaptations leading toward long-term sustainability (Readman 2014). Harking back to mixed-scanning (Etzioni 1967), resilience is the muddling through to the normative and outcome driven thinking of sustainable development.

Planning in the agricultural regions of the Global South generally uses a paradigm of solutions framed at national or state levels and implemented uniformly by government actors, with little place-based consideration of local agricultural systems. Neglect of local and regional issues in agricultural policy means that planners are largely absent from questions of adaptation in industries such as coffee, even though these industries have tremendous effects upon landscapes and wellbeing. Planning research needs to develop knowledge and understanding of the factors that affect change and growth of industries at the regional level, especially in agriculture. Agriculture is particularly amenable to a spatial approach, because adaptation and change occur largely at the level of regional clusters and landscapes.

Clusters are complex local systems, and thus present challenges for planners because of their diversity of interests, self-organizing nature, and shifting compositions. They present ideal forums for a decentralized collaborative approach to planning (Wilkerson 2011, Innes and Booher 2010), but this is a challenge because clusters are the diffuse local manifestations of global production systems. By framing their resilience as a constant re-negotiation of their position in the Global Value Chain there is room for addressing purposeful change initiated by local actors. Influencing how clusters adapt may be the most effective way of implementing larger scale changes for sustainability. Despite organizations such as the World Bank actively promoting cluster-based development (Giuliani 2013), a framework for understanding resilience in clusters that might be used as a platform for policy development and collective action is lacking. This is the rationale for developing the adaptive efficiency model.

Adaptive efficiency in the context of resilience recognizes that adaptation occurs over many dimensions and over many scales, which are framed by the dual perspectives of the impact of place with Global Value Chains and the specific local characteristics of clusters.

Global Value Chains (GVC) are the economic meta-structures for resilience in any area's economy and for industries in that area. Planners thinking about economic development need to situate efforts to support industries within a framework of a region's place within GVCs, and how this, in turn, affects resilience. The possibilities for adaptation are very different for industries in different regions due to labour costs and, in the case of differentiated agricultural products, environmental conditions. Planners working with agricultural development need to think about policy and planning at scales that consider the power relationships of local clusters with the GVC.

But an exclusive focus on the GVC obviates the particularities of place and the large literature affirming that "region-specific" factors do matter. Here I refer to work pioneered by Massey, Storper, Saxennien, Markusen, on regional advantages, and applied to resilience recently by planners and economic geographers (Christopherson et al 2010, Pendall 2010, Simmie and Martin 2010, Martin 2012). These are good foundations, but planning and applied economic geography suffer from a dearth of knowledge about how "region-specific" factors impact resilience (Martin et al 2016).

The model presented in this dissertation builds on previous work on clusters in developing countries, most directly the importance of *collective efficiency*, relational networks, and agglomeration, in emerging manufacturing clusters in the developing world (Schmitz 1995, and Schmitz & Nadvi 1999), social capital (Putnam 1995, Adger et al 2008), and the dynamics of regional clusters and their link to global value chains, especially in terms of knowledge networks (e.g., Nadvi, Giuliani and Bell 2005, Giuliani 2003, Morrison and Rabellotti 2009, Pietrobelli and Rabellotti 2011). I also drew deeply from the institutional perspective on regions innovated by North (1990,1993,1994), from whom

I borrow the term *adaptive efficiency*, to give it a more robust definition within regional development. I use this term, because my model is based on an institutionalist view of *collective efficiency* applied to resilience.

The research on each of the three prongs in my adaptive efficiency model – social, relational, and spatial factors – contribute in their own right to contemporary topics in planning and economic geography, such as how institutions impact regional development (e.g., Rodríguez-Pose 2013, Clark 2016), the role of networks in clusters (e.g., Ter Wal and Boschma 2011), the connection of clusters to knowledge networks (e.g., Giuliani 2013), and the importance of trust and governance (Nooteboom 2007, Visser and De Langen 2006, McDermont 2007). The research also addresses underexplored spatial questions in agricultural clusters, such as agglomeration (e.g., Garrett 2013). For cooperatives, much is known about their pro-social nature (Wollni et al 2010, Wollni et al 2012), but few studies have documented the extra-organizational spillovers their community driven missions produce. This dissertation has attempted to make small contributions to these questions by using social network analysis and case studies of clusters, approaches previously used to explain the emergence of new high quality wine regions, and a regression analysis of land use change based on Rueda and Lambin (2013a), which more explicitly includes agglomeration factors.

11.1 Contributions of the Adaptive Efficiency Model

The research employs case studies to show that institutional variation can affect resilience. The case studies compare national level differences between Costa Rica and Mexico, indigenous versus mestizo contexts in Mexico, and institutional variation based on firm ownership, specifically, whether cooperatives have positive impacts on the adaptive efficiency of clusters.

Governance solutions that can negotiate better relationships within the GVC are often at scales larger than the local level, at least in commodities-driven industries. Agricultural industries that enjoy long-term success are often heavily sponsored by national legislation (e.g., American cotton (Rivoli 2014)). Costa Rica offers a case where a central governance system offers a stable transparent base for the industry, yet it does not fully support the consolidation and empowerment of local clusters. Starting in the 1950s, Costa Rica created a more open and inclusive value chain, requiring that large processing firms treat farmers equally in terms of price regardless of the amount of coffee they produce and limiting the profits mills and exporters can take as compared with farmers. Costa Rica also created a governance mechanism (ICAFE) which distributes export profits among growers, millers, exporters, and roasters, with the preponderance of the power in the hands of farmers. ICAFE and its spin-off organizations remain centralized in its management approach, making the Costa Rican model strong nationally and weak regionally.

Mexico lost its strong national support for coffee and has been described as "terrifying" for small growers (Reinhard, 2014). In Mexico, state-level initiatives have been too broad and too generic to gain buy-in from producers, given the weak reputation of Mexican coffee in international markets. In Mexico, the system of land tenure historically linked to a strong state model persisted after resources to support it were cut. In Mexico, the structure of the coffee industry does not generally support learning and resilience for farmers. The lead firms rely on purchasing agents and have not built strong relationships with small farmers. The case is even more pronounced with indigenous communities. The challenge for coffee producers in rustic farming systems is real: credit relationships are complicated, farmers often sell to the highest bidder (a problem for cooperatives), and the unregulated purchasing agent (coyote) system keeps firms from having to make investments of embedding themselves in a region. The dismantlement of state structures meant to support small-holder agriculture contributed to the emergence of this system, and reduced adaptive capacity for the industry. Hundreds of thousands of farmers persist in coffee production at scales too small for market mechanisms to finance on-farm investments. While some have organized into cooperatives as FairTrade and organic producers to claim a place in the GVC, many others have not. These isolated farmers are cut off from support mechanisms that would allow them to made positive adaptations.

The institutional variation between the ICAFE structure in Costa Rica and Mexico's weak governance mechanisms suggests that, absent strong government programs, there is no clear way to support small holder growers in systems that rely on selling to commodity market purchasers who are not willing to invest in long-term relationships. The Mexico cases expose the vulnerability of farmers selling to conventional markets without price support or larger structural protections, whereas in Costa Rica laws protect the bargaining power of small farmers. These conditions breed mistrust, and disengagement, leading to a vulnerable industry, especially in areas with histories of discrimination and social exclusion.

However, a region's place in the GVC is not entirely a function of anonymous global forces and national structures. Work on wine clusters suggests that they need a persistent organization at the regional level dedicated to a territorially bounded vision of development to empower different stakeholder groups around common challenges, and public-private institutions with multiparty governance rules that foster joint agenda setting. (McDermott 2007, 132); collective efforts also contribute to Napa's sustained preeminence (Hira and Swartz 2015). My case studies show that, in the case of coffee, a productive institutional structure starts at the national level and must be adapted and reconfigured at the cluster level.

Considering the paucity of local public-private intermediaries in coffee, one could argue that Mexico and Costa Rica lack crucial institutions at the local cluster level. That is, they both lack "institutional thickness" (Amin and Thrift 1994 & 1995) for governance, especially at the local level. My case studies show that cooperatives play a special and valuable role filling this gap and in promoting agricultural resilience.

The most resilient clusters in this study all had strong territorially grounded networks among their region's firms despite the absence of organizations with region-specific resources and a mandate to support them. Within the clusters, the anchoring institutions are the lead firms. The research shows that cooperatives play a central role in the absence of a clear cluster governance system. In the absence of official local governance systems, resilient adaptation within global value chains requires the existence of strong locally anchored firms that are willing to provide services for farmers and to act as knowledge and resource gatekeepers. In this study, those firms tended to be cooperatives, although not all cooperatives had the organizational capacity to fulfill these functions or the financial depth to purchase enough coffee to be central actors.

Clusters with the strongest local firms were the ablest to take advantage of national resources and government support, and cooperatives often led the way in adaptations, such as environmental certifications and finding new market niches. Compared to cooperatives, privately-owned firms were quicker to close in times of economic stress, and multinationals were footloose, shifting from region to region.

A mix of firm ownership forms also contributed to resilience in the more successful cases because the variety created alternative business models and greater competition for the coffee produced by the region's farmers. The Costa Rica Prime High Coop case experienced an explosion of micromills, together with continued competition from multinationals. The ability to foster new typologies of firms while maintaining key anchor firms appears central to adaptive efficiency. However, cases from non-prime regions in Costa Rica remind us that there are no panaceas (Ostrom 2009) and the ability for firms in a cluster to adapt successfully is constrained by both their institutional context and their position in the GVC.

This finding may inform broader spatial policy. For example, if a city is going to incentivize development of a grocery store in an underserved area, it might think about incentivizing the presence of a cooperative firm with a long-term mission in the area. Cooperatives can be a model for local agriculture, but they require strong policy support as can be observed with cotton cooperatives (Rivoli 2014).

Finally, agglomeration within clusters and physical proximity appear to interact with networks in important ways by creating denser, reinforcing relationships. The data show that proximity to industry infrastructure improves resilience, suggesting industrialization economies exist in these industries. The loss of a critical mass of producers and mills in a cluster had a downward-spiraling effect on the whole cluster's resilience. The qualitative findings suggest that breakdown of the cluster support network, its relationships, and key institutions are key elements in clusters that fail to successfully adapt.

Understanding the key institutional and relational elements of support for farmers is an important strategy not only for upgrading, but also for identifying ways to assist struggling regions. In this sense, a question that must be asked is whether there is a critical mass of producers who could together cooperate to negotiate solutions for the cluster and create value create with the GVC. More isolated farmers appear to be more vulnerable and less resilient, a finding that gels with work even in agricultural industries based around large land holders in industries such as cotton (Rivoli 2014).

11.2 National Governance to Support Regional Planning in Agriculture

My cases suggest that agency for regional resilience must be built from both a bottom-up and top-down perspective. Mexico shows the difficulty of local organization and farmer support in the absence of a strong national policy and support framework. Mexico's history also exposes the dangers of a state-sponsored agricultural industry that grows in the absence of a market feedback loop. In contrast, Costa Rica's model is a version of regulated market governance. It has allowed some regions to decline precipitously when the GVC no longer valued the grade of coffee produced in the region, but it left other areas with local institutions that were capable of steering adaptation and flourishing.

National policy must be crafted to respect the diversity of production niches within a country with respect to the GVC. Policy and planning that does not do this will marginalize those areas who are vulnerable under the status quo, and potentially impede innovation in leading regions (McDermott 2007, Hira and Swartz 2015, Clarke and Ramirez 2013, Giuliani 2007). What occurs in the clusters included in this study is self-organizing collective adaptation, which might explain why efforts to impose local government structures from above have failed to empower localities. The absence of a clear mechanism for adapting policies to the varying realities of local clusters creates conditions that do not engage communities on their own terms or in a way that recognizes that resilience strategies will take different shapes in different contexts. Both Mexico's and Costa Rica's stuttering efforts to construct denomination of origin systems show the difficulty of planning locally from the top down, especially when the policy is not based around reconfiguring the value chain to empower regional systems and local actors.

Planning has a deeper role related to the normative goals of sustainability, as pertains to region-specific actors in an industry. Bridges can be made by planners between resilience's adaptation focus and sustainability's social and environmental orientation by understanding that firms need to participate fully in the cluster governance of the regions from which they purchase coffee. Multinational firms seldom have incentive to expand their local relationships. Creating a law such as Costa Rica's that requires mills to buy directly from farmers in-situ and register every sale has been one way to create presence but it is insufficient if not accompanied by mechanisms to institutionalize longer-term relationships with farmers such as favorable credit, more favorable pricing, and technical assistance. The adaptive efficiency model contributes by bringing attention to institutional factors both within the cluster and as they effect the relationship with the GVC.

This study also documented and measured cluster level knowledge networks. It used social network analysis to compare clusters and identify key actors. Policy makers should identify these cluster-level networks as prime spaces for planning. Regional bridging institutions can, in some cases, change the trajectory of a region's place in the GVC (McDermott 2007), but this requires a relational and institutional context able to promote collective action for common goals.

Finally, this study found that agglomeration and spatial factors are important in agriculture. There is a need to think about a policy context that helps local regions maintain a critical mass of production, build locally embedded knowledge networks, and create an institutional structure that fosters value capture and value building for local actors, as well as collaboration and joint learning.

In this sense, the adaptive efficiency model is a useful structure for thinking about planning to foster resilient agricultural clusters. How to make that work might be seen through the lens of the Diversity, Interdependence, Authentic Dialogue (DIAD) framework which argues complex issues are best approached in a forum of diverse actors, where actors can recognize potential mutually beneficial ends and none have undue power over the others (Innes and Booher 2010, Susskind 2010) or communicative planning strategies to foster resilience in clusters (Goldstein 2010). Understanding how the elements of the adaptive efficiency model work in clusters can help devise strategies to make them stronger and to understand how to create stakeholder driven-governance with appreciation of local context.

There is currently a movement to revive INMECAFE in Mexico (Escamilla 2016), and to place renewed emphasis on both clusters and value chains (Cardenas 2014). If INMECAFE is revived, a planning approach that considers the adaptive efficiency framework may remind policy makers that one of the most enduring elements of cluster theory is the importance of locality (Porter 1998) and the need to integrate national policy with regional policy and action.

Finally, there is a need for an international perspective about the larger political economy of coffee and the role of commodities markets (Talbot 2004). The instability caused by the commodity system and its regional inequities is a primary challenge for national actors, which were largely disempowered after the end of the ICA. Regional resilience and adaptive efficiency at the cluster level are insufficient alone, because a larger dialogue is needed regarding the inherent sustainability of the coffee marketing and production system. This echo's Massey's observation that regional inequality is a function of the production system itself (Clark 2015, Massey 1979). The present study suggests that regional resilience is also largely a function of the priorities of the GVC for coffee. This lesson can extend to planners who have a local and regional focus. To build resilient local systems, thinking regionally is insufficient. We need to actively engage with larger discussions about global production systems and their long-term sustainability.

APPENDIX

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Página de Presentación – Encuesta Beneficios

La presente encuesta es parte de una investigación que tiene como objetivo evaluar las estrategias y redes de colaboracion dentro del sector cafetelero en Chiapas para promover la sostentabilidad de los nucleos locales de produccion. Los datos tomados son confidenciales en cuanto a su persona y solamente se reportaran globalmente en cuanto a las instituciones mencionadas.

1. Nombre Suyo ____________________	2. Puesto ____________	3. Telefono: ____________________
4. Email ________________	5. Nombre de la Organizacion: ____________	6. Año de Fundación del Beneficio o Organizacion: ________
7. Su organización forma parte de una empresa matriz? Si No Nombre: ____________________	8. Numero de empleados: a)Benefico ________________ b)Empresa en Veracruz ____________	9. Numero de empleados agronomicos ______________ a)Maestria ______ b)Licenciatura ______ c)Prepa ______ d)Grado Tecnico ______ e)Otro ______
10. Numero de empleados de comercializacion ______ a) Maestria ______ b) Licenciatura ______ c) Prepa ______ d) Grado Tecnico ______ e) Otro ______	11. Numero de empleados gerenciales: ______ a) Maestria ______ b)Licenciatura ______ c) Prepa ______ d) Grado Tecnico ______ e) Otro ______	Su Organizacion: 1) Maneja beneficio humedo Si___No___ 2) Maneja Beneficio Seco Si___ No___ 3) Exporta directamente Si___No___

11. Estime el numero de productores que entregaba a su beneficio en los siguientes años:	11. Estime la cantidad de café en pergamino o grano de oro que ha vendido en los seguientes años.	11. Estime el precio medio de su café en los siguientes anos.	12. ¿Cuáles certificaciones tenía su firma en el 2001, 2006, y Actualmente? ¿Qué porciento de sus ventas representaban? Escriba la Certificacion y El Porciento de Ventas en las Casillas Abajo					
2001	2001	2001	Certificaciones	Porciento Estimado	2006	Porciento Estimado	En Este Año Pasado	Porciento Estimado
2006	2006	2006	Nombre					
2012-2013	2012-2013	2012-2013	Nombre					
2013-2014	2013-2014	2013-2014	Nombre					

Las siguientes preguntas intentan medir sus percepciones sobre la industria local del cafe. Sus contestaciones son confidenciales sobre su persona y solamente se reportaran globalmente en cuanto a las instituciones mencionadas.

	Asuntos de Ambiente y Sustentabilidad	Promoción Coordinada del Café de Su Region	Infraestructura Compartida	Asuntos fitosanitarios (plagas)	Reputacion de Calida de la Region	Practicas Agronomicas Inovadoras	
Evalúe la importancia de los siguientes asuntos para la industria cafetalera local	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1:Muy Poca 2:Poca 3:Moderada 4:Mucha 5:Extrema
Evalúe el nivel de colaboración que existe alrededor de este asunto.	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5	
Determine si la colaboración alrededor de este asunto a aumentado o disminuido en la última década.	0. Disminuido 1. Igual 2. Aumentado	0. Disminuido 1. Igual 2. Aumentado	0. Disminuido 1. Igual 2. Aumentado	0. Disminuido 1. Igual 2. Aumentado	0. Disminuido 1. Igual 2. Aumentado	0. Disminuido 1. Igual 2. Aumentado	

Las siguientes preguntas intentan medir la diversidad de contactos de los actores en la indusria del cafe tanto dentro y fuera del sector.

Nombre los 5 compradores finales más importantes en los últimos 3 años (Puede Estimar) y antes del 2006		Cuales son los suplidores de agroquimicos y materiales más importantes para los productores en esta zona?	Cuales son las fuentes de credito más importantes utilizadas por su organización y para sus productores?	Su organización vende microlotes? (Lotes de café con trazabilidad directa a nivel productor?)
Ultimos 3 años	Antes del 2006	Tienda/Firma (Ubicacion)	Organización-Sucursal (Ubicacion)	Año y Cantidad (Estimar)
1	1	1	1	1
2	2	2	2	2
3	3	3	3	3
4	4	4	4	4
5	5	5	5	5

Su firma participa de la competencia Taza de Exelencia? De ser así, en cuales años ha participado?	Mencione hasta 5 ferias o convenciones de la industria que su firma ha asistido en los ultimos 3 años.	Mencione hasta 5 organizaciones de la industria donde participan empleados de su organizacion.
Año	Feria-Evento (e.g., SCAA)	Organización-Comité
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5

Instruciones SNA

Parte II: La siguiente parte de la encuesta es diseñada para ayudarnos entender mejor la estructura de los flujos de informacion y la colaboracion entre organizaciones relacionadas con el sector cafetalero. La información será usada para crear una visualizacion y analisis de la estructura de comunicación sobre temas relacionados con el cafe en su área.

Instrucciones: Abajo usted puede observar un exemplo del formato de las preguntas en la siguiente seccion. Marque con una EQUIS (X) si mantiene colaboraciones o comunicaciones con las organizaciones y con una EQUIS (X) sobre cada renglón temático que aplica a sus comunicaciones. Además, se le pide indicar la frequencia de comunicación y su confianza con SOLAMENTE aquellas organizaciones con las cuales mantiene comunicaciones o colaboraciones. Si no tiene contacto con una organización debe dejar la fila en blanco. Si en las siguientes paginas no aparece una organización.firma con la cual usted mantiene comunicaciones o colaboraciones por favor escribirlo en los espacios proveidos.**Si no comunica con la organizacion, deje la casilla en blanco.**

A) Colaboracion Formal	
A) Intercambio de Informacion	Marque con una CRUZ o EQUIS si colabora o comunica con una de las organizaciones enumeradas en las casillas. Sus comunicaciones pueden referirse a comuniaciones formales sobre**projectos conjuntos**,**consultas informales, conversaciones telefonicas, etc. Si no comunica con la organizacion, deje la casilla en blanco.**
B1)Temas Tecnicos	Marque con una CRUZ o EQUIS si el contenido de sus colaboraciones o comunicaciones incluye temas tecnicos. Estos pueden incluir 1) procesos de mejoramiento o gestion del lado técnico del beneficio, 2) temas agronomicos o en cuanto a control de plagas para los agricultores que le entregan café, o 3) temas de mejora del producto final.
B2)Temas de Mercadeo	Marque con una CRUZ o EQUIS si el contenido de sus colaboraciones o comunicaciones se relaciona a la promoción de su café ya que sea para 1) buscar n**uevos compradores**, 2)**inovar en cuanto a los productos ofrecidos**, 3) mejorar comunicaciones con compradores finales, o 4)**temas generales de promoción**.
B3)Temas Ambientales	Marque con una CRUZ o EQUIS si el contenido de sus colaboraciones o comunicaciones se relaciona 1) cumplimiento de leyes ambientales, 2) produción de café con etiquetas ambientales (e.g. Orgánico), 3) redución de uso de fertilizantes artificiales y agroquimicos, 4) siembra de arboles, o 5) o esfuerzos de reducir uso de agua y luz en su beneficio.
B3)Temas de Promocion del Café de la Zona	Marque con una CRUZ o EQUIS si el contenido de sus colaboraciones o comunicaciones se relaciona al fomento local del café, e.g. 1) desarrollo de Denominación de Origen, 2) colaboración en temas de diversificar el café, 3) promoción conjunta del café de su área, 4) colaboración sobre plagas locales.

Marque con una cruz las instituciones con las cuales usted está en contacto.		**Marque con una cruz cada tematica que aplica a sus comunicaciones con las instituciones con las cuales mantiene contacto.**				**Frequencia De Contacto**	**Su Confianza en el Desempeño de Dicha Organización**	
	Marque si usted colabora formalmente con una de las siguientes organizaciones	**Marque con una cruz las instituciones con las cuales usted intercambia informacion**	**Marque con una cruz cada tematica que aplica a sus comunicaciones con las instituciones con las cuales mantiene intercambia informacion ya que sea formalmente o de manera informal.**				**Frequencia De Contacto**	**Su Confianza en Dicha Organización**
Otro Beneficio, Finca u Org. Productora	X = Si Blanco=NO	X = Si Blanco=NO	Tecnicos	Mercadeo	Ambiental	Fomento Local	Frequencia	Confianza
Institución A							1 2 3 4 5	1 2 3 4 5
Institución B	**x**	**x**		**x**			1 2 3 4 5	1 2 3 4 5
Otro Beneficio: Starbucks (por							1 2**3X**4 5	1 2 3**4X**5

	Marque con una cruz las instituciones con las que ***colabora formalmente***	**Marque con una cruz las instituciones con las cuales usted intercambia informacion.**	**Marque con una cruz cada tematica que aplica a sus comunicaciones con las instituciones con las cuales intercambia informacion ya sea formalmente o de manera informal.**				**Frequencia De Contacto**	**Su Confianza en Dicha Organización**
Instituciones	**Colaboramos Formalment X = Si Blanco=NO**	**Intercambiamos Informacion X = Si Blanco=NO**	**Sobre Temas Tecnicos**	**Sobre el Mercadeo**	**Sobre la Sostenabilidad Ambiental**	**Sobre el Desarrollo Colaborativo de La Industria Local del Cafe**	**1:Raramente 2:Anualmente 3:Varias Xs al año 4:Mensualmnete 5:Semanalmente**	**1:Muy Baja 2: Baja 3: Regular 4: Alta 5: Muy Alta**
Educativas	X = Si Blanco=NO	X = Si Blanco=NO	Tecnicos	Mercadeo	Ambiental	Desarrollo Local	Frequencia	Confianza
U. VERACRUZANA (Indique sede)							1 2 3 4 5	1 2 3 4 5
INSTITUTO DE ECOLOGIA (Indique sede)							1 2 3 4 5	1 2 3 4 5
UNIVERSIDAD AUTONOMA DE CHAPINGO (Indique sede)							1 2 3 4 5	1 2 3 4 5
UNAM (Indique sede):							1 2 3 4 5	1 2 3 4 5
Nombre:							1 2 3 4 5	1 2 3 4 5
Nombre:							1 2 3 4 5	1 2 3 4 5
Nombre:							1 2 3 4 5	1 2 3 4 5
Gubernamentales	X = Si Blanco=NO	X = Si Blanco=NO	Tecnicos	Mercadeo	Ambiental	Desarrollo Local	Frequencia	Confianza
SAGARPA (Indique Oficina)							1 2 3 4 5	1 2 3 4 5
SAGARPA (Indique Oficina)							1 2 3 4 5	1 2 3 4 5
SAGARPA-ProCampo							1 2 3 4 5	1 2 3 4 5
SEDARPA (VERACRUZ)							1 2 3 4 5	1 2 3 4 5
INCAFECH (COMCAFE) Oficinas Locales							1 2 3 4 5	1 2 3 4 5
COMITE SISTEMA PRODUCTO CAFE							1 2 3 4 5	1 2 3 4 5
INIFAP (Indique Oficina)							1 2 3 4 5	1 2 3 4 5
COMISION FEDERAL DE ELECTRICIDAD							1 2 3 4 5	1 2 3 4 5
CONSEJO ESTATAL DE SANIDAD VEGETAL (Indique oficina)							1 2 3 4 5	1 2 3 4 5
CONAFOR							1 2 3 4 5	1 2 3 4 5
CONAGUA							1 2 3 4 5	1 2 3 4 5
SEDESOL							1 2 3 4 5	1 2 3 4 5
SEDESICA (Indique Oficina)							1 2 3 4 5	1 2 3 4 5
SEMARNAT (Oficina):							1 2 3 4 5	1 2 3 4 5
MUNICIPIO (Nombre):							1 2 3 4 5	1 2 3 4 5
MUNICIPIO (Nombre):							1 2 3 4 5	1 2 3 4 5
OTRA GOB:							1 2 3 4 5	1 2 3 4 5
OTRA GOB:							1 2 3 4 5	1 2 3 4 5
OTRA GOB:							1 2 3 4 5	1 2 3 4 5

Page 4

Marque con una cruz las instituciones con las que ***colabora formalmente***	Marque con una cruz las instituciones con las cuales usted intercambia informacion.	Marque con una cruz cada tematica que aplica a sus comunicaciones con las instituciones con las cuales intercambia informacion ya sea formalmente o de manera informal.				Frequencia De Contacto	Su Confianza en Dicha Organización
X = Si Blanco=NO	X = Si Blanco=NO	Tecnicos	Mercadeo	Ambiental	Desarrollo Local	1:Raramente 2:Anualmente 3:Varias Xs al año 4:Mensualmnete 5:Semanalmente	1:Muy Baja 2: Baja 3: Regular 4: Alta 5: Muy Alta
						1 2 3 4 5	1 2 3 4 5
						1 2 3 4 5	1 2 3 4 5
						1 2 3 4 5	1 2 3 4 5
						1 2 3 4 5	1 2 3 4 5
						1 2 3 4 5	1 2 3 4 5
						1 2 3 4 5	1 2 3 4 5
						1 2 3 4 5	1 2 3 4 5
						1 2 3 4 5	1 2 3 4 5
						1 2 3 4 5	1 2 3 4 5
						1 2 3 4 5	1 2 3 4 5
						1 2 3 4 5	1 2 3 4 5
						1 2 3 4 5	1 2 3 4 5
						1 2 3 4 5	1 2 3 4 5
						1 2 3 4 5	1 2 3 4 5
						1 2 3 4 5	1 2 3 4 5
						1 2 3 4 5	1 2 3 4 5
						1 2 3 4 5	1 2 3 4 5
						1 2 3 4 5	1 2 3 4 5
						1 2 3 4 5	1 2 3 4 5
						1 2 3 4 5	1 2 3 4 5
						1 2 3 4 5	1 2 3 4 5
						1 2 3 4 5	1 2 3 4 5
X = Si Blanco=NO	X = Si Blanco=NO	Tecnicos	Mercadeo	Ambiental	Desarrollo Local	Frequencia	Confianza
						1 2 3 4 5	1 2 3 4 5
						1 2 3 4 5	1 2 3 4 5
						1 2 3 4 5	1 2 3 4 5
						1 2 3 4 5	1 2 3 4 5
						1 2 3 4 5	1 2 3 4 5
						1 2 3 4 5	1 2 3 4 5
						1 2 3 4 5	1 2 3 4 5
						1 2 3 4 5	1 2 3 4 5
						1 2 3 4 5	1 2 3 4 5
						1 2 3 4 5	1 2 3 4 5
X = Si Blanco=NO	X = Si Blanco=NO	Tecnicos	Mercadeo	Ambiental	Desarrollo Local	Frequencia	Confianza
						1 2 3 4 5	1 2 3 4 5
						1 2 3 4 5	1 2 3 4 5
						1 2 3 4 5	1 2 3 4 5
						1 2 3 4 5	1 2 3 4 5

Aspecto Económico:	
A) Cuáles son los asuntos económicos más cruciales que confronta actualmente la industria cafetalera en su país? B) Son difrentes los retos economicos presentados por los problemas fitosanitarios (e.g. roya) y los estresores de los mercados (e.g. precios)	
Existe diferencia entre los asuntos económicos enfrentados en esta zona en comparación con otras zonas del país? De ser así expliquey detalle si han habido cambios significativos en la última década.	
De que manera colaboraron los diferentes actores locales durante los años de caida en los precios del café? Que medidas adaptativas ayudaron a los productores locales a sobrevivir la crisis del café?	
Puede detallar esfuerzos relaizados por su firma para apoyar productores durante tiempos de mala cosecha, plagas o caida en precios?	
Aspecto Inovación:	
Cuales han sido los cambios más significativos que ha presenciado en la industria del café en la pasada década?	
Como se ha adaptado a la creciente demanda por café diferenciado? (e.g. Microlotes o café de origen)	
Puede mencionar esfuerzos tomados por su firma para innovar su proceso de producción cafetalera?	
Puede mencionar esfuerzos tomados por su firma para fomentar la inovacion entre los productores que le entregan cafe? Que hacen para el tema de la calidad?	
Percepciones Aspecto Ambiental:	
Cuáles son los asuntos ambientales más cruciales que confronta actualmente la industria cafetalera?	
Existe diferencia entre los asuntos ambientales enfrentados por los beneficios vs los productores ? De ser así, explique	
Puede dar ejemplos de iniciativas tomadas por su firma para promover sustentabilidad y lidiar con cambio climático?	

Instituto de Tecnología de Georgia (GATech)

ECOSUR (El Colegio de la Frontera Sur)

Título del proyecto: Beneficios y características de las redes cafeteras, y redes corporativas sociales

Investigadores: Michael Elliott, PhD, y Thomas Douthat, JD

Se le solicita que sea voluntario en un estudio de investigación sobre las redes sociales de su empresa en la industria del café.

Objetivo: el objetivo de este estudio es comprender mejor las redes sociales y empresariales de las organizaciones cafetaleras, y cómo contribuyen al exito de las industrias locales del café.

Procedimientos: el estudio consiste en una encuesta sobre los negocios de su empresa, gobierno y contactos de ONG. No debería llevarle más de 30 minutos seguido de una entrevista semiestructurada de 30 minutos.

Riesgos: al participar de este cuestionario, usted permite a los investigadores utilizar información que ha sido divulgada voluntariamente sobre su empresa y conexiones personales. Esta información se utilizará para fines académicos. Los investigadores protegerán toda la información personal y solo se publicara de forma anónima.

<u>Beneficios:</u> el estudio creará un mayor entendimiento sobre la función de los intermediarios del café al promocionar y preservar el cultivo de café. Esperamos que ese conocimiento contribuya a mejorar la política pública y las estrategias de la industria para promocionar comunidades y economías locales de café resistentes.

<u>Confidencialidad:</u> en el estudio se seguirán los siguientes procedimientos para mantener confidencial su información personal: La información recopilada sobre usted se mantendrá confidencial en la medida en que lo permita ley. Su nombre no aparecerá en los resultados que este estudio presentará o publicará, y en la medida de lo posible, mantendremos a su organización en el anonimato. Sin embargo, esto puede ser limitado debido a la pequeña cantidad de empresas en la industria local del café.

Para asegurar que esta investigación se lleva a cabo de manera adecuada, es posible que la Junta de Revisión Institucional (Institutional Review Board, IRB) del Instituto de Tecnología de Georgia y El Colegio de la Frontera Sur revise los registros del estudio. Con su consentimiento verbal, el investigador grabará la entrevista semiestructurada para codificar e interpretar el contenido de la conversación de manera más precisa. Esta grabación se guardará en un lugar seguro bajo llave y no se divulgará a terceros.

Derechos del entrevistado:

- Su participación en este estudio es voluntaria. No tiene que participar en este estudio si no desea hacerlo.
- Tiene derecho a cambiar de opinión y abandonar el estudio en cualquier momento sin dar ningún motivo y sin que ello implique ninguna penalización.
- Se le dará a conocer cualquier información nueva que pueda hacerle cambiar de opinión acerca de su participación en este estudio.
- Se le ofrecera una copia de este documento de consentimiento para que la conserve.

Preguntas sobre el estudio:

- Si tiene preguntas sobre el estudio u objeciones relacionadas con la entrevista, puede comunicarse con el Dr. Michael Elliott al (404.894.9841 (USA)) o enviar un correo electrónico a michael.elliott@coa.gatech.edu. También puede comunicarse con Thomas Douthat si envía un correo electrónico a tdouthat@gatech.edu o tdouthat@gmail.com.

Si completa la encuesta adjunta y participa de la siguiente entrevista, se considera que usted ha leído (o ha solicitado que le lean) la información que contiene esta carta y que quiere ser un voluntario en este estudio de investigación.

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[i] A new mill for a small farm in Costa Rican cost between $50,000 to $200,000, and often requires loans leveraged against land, at high interest rates. Beyond monetary barriers, these mills require a level of business savvy and knowledge about coffee not held by most small holder farmers. Thus, early entrants were wealthier farmers, “well financed and savvy,” and they saw significant success and attracted national and international acclaim. Because these smaller mills focused on the specialty market were doing well, others who saw success quickly copied them. This process accelerated with the Cup of Excellence (Meehan 2007), a blind cupping competition and auction system first conducted in Costa Rica in 2006, which could thrust an unknown farmer to the forefront of international specialty markets. Now given the apparent success of pioneer micromills and the existence of more local infrastructure, one respondent noted, “[t]here's plenty of micromills that mortgaged the farm, with no market connections, no idea, just figured that

it could be processed and sold, but this had risks." However, although entrepreneurial government agents and certain actors in the region saw these new smaller mills as the future, Costa Rica's regulatory structure was ill adapted to support larger mills to engage in farmer-level differentiation, and it was equally unprepared for a whole new institutional class of milling organizations. One farmer related the mired problems he faced as an early entrant:

> I was crazy enough to do it. If I knew what I was getting into it, there was no rules, no one to follow. The ICAFE had no idea how to deal with micromills. I had to go through the entire massive permitting process like a COOP. It took 2 years to see the permits. They hassled me, they kept me from what I was doing. ICAFE goes to the conferences and promote CR coffee. Other than that, everybody [doing micromills and microlots] cheats on their reporting I had to (with permission) under-report costs per-pound.

These on-farm mills, and small producers' association run mills, have largely escaped the environmental regulation applied to larger mills. In part MAG has presented them as environmental alternatives. Many started with new lower-water system machinery. At the same time, there is a perception that these small mills have little or no environmental consequences. One local miller admitted that "…environmentally we have done very little. In that part, one needs lots of training, to know what to do, how to do it, and in reality we need more support and help to manage the environmental aspects of milling. We took some steps, but we need to do more."

Building this infrastructure required both new forms of organizations, relationships, and knowledge building. In the mid-2000s this was a largely educational process, because farmers had little experience with specialty markets, and most were used to selling to cooperatives or multinational exporters. Most Costa Rican farmers had never cupped their own coffee, or any other. Larger farms might have these capabilities, and export directly, but this was not common, and presented a series of relational and knowledge transaction costs. The early 2000s were a period that incentivized the creation of these new relationships because of extremely low international prices on commodities markets.

These brokers had to educate farmers to meet ever evolving expectations of third wave roasters and the specialty market. This involved advice about improving soil management, pruning and growing practices, new milling techniques (such as honey coffees and African drying beds), proper supply chain management, and also a clear consideration to the expectations of roasters. This also implied extensive cuppings, including the farmers, to achieve the desired taste profile and adjust farm management accordingly (Mena 2011, Mena 2014). One farmer who was a pioneer of this in the region:

> You need a reputable, honest person or company that is focused on microlots. Many people try to pay high without understanding what the international roasters are looking for. Most cuppers are not used to unusual or exotic coffees, that are outside the profile of a nice standard coffee. To

learn this means cupping thousands of coffees. It is not something that a farmer can understand, you also need a phenomenal roaster. That has been a huge barrier, if you don't have the cupping or lab ability, in a developing country, if you don't have access to an honest voice that can counsel you on price, you are at the mercy of who shows up at your door. An honest broker or clearing house is essential. I believe in private sector; they are motivated to buy-low and sell high. The roasters put pressure on for prices, and want to talk to the producers. Roasters are hiring people that speak Spanish. Sometimes the intermediaries cheat the producers, [but there are very good ones]

These intermediaries transformed from being mere exporters and brokers, to maximize the value of knowledge, hiring agronomists and working more closely with farmers. These relationships also made the farm and the farmer's personality a point of value as demonstrated in the Specialty Coffee Index (http://www.transparenttradecoffee.org/#!scrpi/c1nj). Whereas before farmers had been largely anonymous, they now can meet and directly negotiate with buyers. These relationships tend to limit themselves to farm visits a few times a year, often with the broker, but they motivate farmers, and help them understand the end customer. The new brokers were crucial cultivating contacts with specialty roasters, and third-wave roasters, and bringing them to farmers in Costa Rica.